

HP StorageWorks Continuous Access XP user's guide

XP48
XP256
XP512

April 2004

part number: B7905-96006

This guide describes the requirements and procedures for using Continuous Access XP



© Copyright 2000-2004 Hewlett-Packard Development Company, L.P. All rights reserved.

Hewlett-Packard Company makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

This document contains proprietary information, which is protected by copyright. No part of this document may be photocopied, reproduced, or translated into another language without the prior written consent of Hewlett-Packard. The information contained in this document is subject to change without notice.

All product names mentioned herein that are not hp trademarks may be trademarks of their respective companies.

Hewlett-Packard Company shall not be liable for technical or editorial errors or omissions contained herein. The information is provided "as is" without warranty of any kind and is subject to change without notice. The warranties for Hewlett-Packard Company products are set forth in the express limited warranty statements accompanying such products. Nothing herein should be construed as constituting an additional warranty.

Printed in the U.S.A.

HP StorageWorks Continuous Access XP User's Guide

April 2004
part number: B7905-96006

About this guide	7
Intended audience	7
Disk arrays	7
Related documentation	7
Conventions	8
Getting help	8
HP technical support	9
HP storage website	9
HP authorized reseller	10
Revision history	11
Warranty statement	12

1 Overview 15

CA components	17
Disk arrays	18
Volume pairs (P-VOLs and S-VOLs)	20
Remote copy links	21
Remote console PC	23
Host servers	24
Host failover software	24
CA volume pair operations	25
Pair status (pairdisplay)	25
Creating a pair (Paircreate)	26
Pairsplit -R, Pairsplit -S (PSUS) and Pairresync	28
Pair suspension (PSUE)	29
Async-CA consistency group operations	33

Async-CA recordset operations	34
Creating and storing Async-CA recordsets at the MCU	34
Sending Async-CA recordsets to the RCU	35
Storing recordsets at the RCU	35
Selecting and settling recordsets at the RCU	36
Types of recordsets	37
Inflow control of recordsets	38
Optimizing CA and disk array performance	41
Sync-CA copy mode	41
Async-CA copy mode	41
Other factors affecting disk array performance	42
Using CA with other data management features	44
Logical Unit Size Expansion (LUSE)	44
Volume Size Configuration volumes	44
Cache LUN	44
HP Secure Manager	44
Business Copy	45
Using CA with BC	45
Using CA with HP Performance Advisor	48
2 Installation	49
Installing the hardware	50
ESCON remote copy connections	51
Channel extenders for ESCON CA	55
Fibre Channel remote copy connections	57
Installing the software	60
3 Configuration	63
HP Continuous Access main control window	64
Volume List box	66
Display Filter window	69
Selecting the CU image	71
Configuring the MCU and RCU ports	72
MCU operations	79
Adding MCUs	79

RCU operations	80
Adding an RCU	80
Setting RCU options	84
Setting RCU path parameters	86
Adding and deleting logical paths for an RCU	92
Adding and deleting SSIDs for an RCU	96
Viewing RCU status	98
Deleting an RCU	100
Async-CA control operations	102
Configuring Async-CA options	102
Adding consistency groups	104
Changing consistency group options	105
Viewing consistency group status	106
Deleting consistency groups	108
4 Pair operations	109
Creating volume pairs (Paircreate)	110
Viewing pair status (Pairdisplay)	116
Viewing pair status for LDEVs	118
Splitting pairs (Pairsplit-R)	123
Pairsplit-R Option window	125
Resuming volume/LDEV pairs (Pairresync)	127
Deleting volume pairs (Pairsplit -S)	130
Pairsplit-S Option window	133
Using CA for data migration and duplication	135
Point-in-time (PiT) data duplication using Async-CA	137
CA status snapshot function	138
Monitoring remote copy activities	140
Saving and deleting remote copy I/O statistics	146
Viewing and saving CA history	150
Powering off/on CA components	156
Planned outage of the MCU	157
Planned outage of the RCU or remote copy connection	157
Planned outage of the MCU and RCU	158
Discontinuing CA operations	159

5	Disaster recovery	161
	Preparing for disaster recovery	162
	Considering the P-VOL fence-level setting	163
	Setting the fence level	164
	Transferring sense information between sites	165
	File and database recovery procedures	166
	Switching operations to the remote site	167
	Analyzing the currency of Sync-CA S-VOLs	168
	Analyzing the consistency of Async-CA S-VOLs	169
	Transferring operations back to the primary site	171
	Resuming normal operations at the primary site	172
6	Troubleshooting	175
	Troubleshooting CA operations	176
	CA error codes	185
	Calling the HP Support Center	186
A	Pinned track recovery	187
	Glossary	189
	Index	193

About this guide

This guide describes how to install and use HP StorageWorks Continuous Access XP on the remote console PC, which communicates through a local area network with HP XP disk arrays.

Intended audience

The instructions in this guide are intended for system administrators who already have the following skills and knowledge:

- A background in data processing and understanding of direct-access storage device disk arrays and their basic functions.
- Familiarity with disk arrays and RAID technology
- Expertise with the operating system, including commands and utilities
- Data processing concepts

Disk arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

HP Surestore Disk Array XP256
HP Surestore Disk Array XP512
HP Surestore Disk Array XP48

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Disk Array XP512/48: Owner's Guide*
- *HP StorageWorks Remote Control XP: User Guide*
- *HP StorageWorks LUN Manager: User Guide*
- *HP StorageWorks Business Copy XP: User Guide*
- *HP StorageWorks Performance Advisor XP: User Guide*
- *HP StorageWorks RAID Manager XP User's Guide*

For information about operating system commands and third-party products, refer to the manufacturer's documentation.

Conventions

This guide uses the following text conventions.

Figure 1	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
www.hp.com	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
literal	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
<i>variable</i>	Italics indicates that you must supply a value. Italics is also used for manual titles.
input/output	Monospace font denotes user input and system responses, such as output and messages.
<i>Example</i>	Denotes an example of input or output. The display shown in this guide may not match your configuration exactly.
[]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
	Separates alternatives in a list of options.

Getting help

If you still have a question after reading this guide, contact an HP authorized service provider or access our website:

www.hp.com

HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/array systems.html>

Be sure to have the following information available before calling:

- technical support registration number (if applicable)
- product serial numbers
- product model names and numbers
- applicable error messages
- operating system type and revision level
- detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP storage website

For the most current information about HP StorageWorks XP products, visit the support website. Select the appropriate product or solution from this website:

<http://h18006.www1.hp.com/storage/array systems.html>

For information about product availability, configuration, and connectivity, consult your HP account representative.

HP authorized reseller

For the name of your nearest HP authorized reseller, you can obtain information by telephone:

United States 1-800-345-1518

Canada 1-800-263-5868

Or contact: www.hp.com

Revision history

March 2004

Updated to support Main window button and function changes, TCP/IP, graduated delay sidefile management, history feature, and saving I/O statistics. Edited extensively to improve readability.

Warranty statement

HP warrants that for a period of ninety calendar days from the date of purchase, as evidenced by a copy of the invoice, the media on which the Software is furnished (if any) will be free of defects in materials and workmanship under normal use.

DISCLAIMER. EXCEPT FOR THE FOREGOING AND TO THE EXTENT ALLOWED BY LOCAL LAW, THIS SOFTWARE IS PROVIDED TO YOU “AS IS” WITHOUT WARRANTIES OF ANY KIND, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. HP SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, NON-INFRINGEMENT, TITLE, ACCURACY OF INFORMATIONAL CONTENT, AND FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow exclusions of implied warranties or conditions, so the above exclusion may not apply to you to the extent prohibited by such local laws. You may have other rights that vary from country to country, state to state, or province to province.

WARNING! YOU EXPRESSLY ACKNOWLEDGE AND AGREE THAT USE OF THE SOFTWARE IS AT YOUR SOLE RISK. HP DOES NOT WARRANT THAT THE FUNCTIONS CONTAINED IN THE SOFTWARE WILL MEET YOUR REQUIREMENTS, OR THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED, VIRUS-FREE OR ERROR-FREE, OR THAT DEFECTS IN THE SOFTWARE WILL BE CORRECTED. THE ENTIRE RISK AS TO THE RESULTS AND PERFORMANCE OF THE SOFTWARE IS ASSUMED BY YOU. HP DOES NOT WARRANT OR MAKE ANY REPRESENTATIONS REGARDING THE USE OR THE RESULTS OF THE USE OF THE SOFTWARE OR RELATED DOCUMENTATION IN TERMS OF THEIR CORRECTNESS, ACCURACY, RELIABILITY, CURRENTNESS, OR OTHERWISE. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY HP OR HP’S AUTHORIZED REPRESENTATIVES SHALL CREATE A WARRANTY.

LIMITATION OF LIABILITY. EXCEPT TO THE EXTENT PROHIBITED BY LOCAL LAW, IN NO EVENT INCLUDING NEGLIGENCE WILL HP OR ITS SUBSIDIARIES, AFFILIATES, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS OR SUPPLIERS BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR OTHER DAMAGES (INCLUDING LOST PROFIT, LOST DATA, OR DOWNTIME COSTS), ARISING OUT OF THE USE, INABILITY TO USE, OR THE RESULTS OF USE OF THE SOFTWARE, WHETHER BASED IN WARRANTY, CONTRACT, TORT OR OTHER LEGAL THEORY, AND WHETHER OR NOT ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Your use of the Software is entirely at your own risk. Should the Software prove defective, you assume the entire cost of all service, repair or correction. Some jurisdictions do not allow the exclusion or limitation of liability for incidental or consequential damages, so the above limitation may not apply to you to the extent prohibited by such local laws.

NOTE. EXCEPT TO THE EXTENT ALLOWED BY LOCAL LAW, THESE WARRANTY TERMS DO NOT EXCLUDE, RESTRICT OR MODIFY, AND ARE IN ADDITION TO, THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE LICENSE OF THE SOFTWARE TO YOU; PROVIDED, HOWEVER, THAT THE CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS SPECIFICALLY DISCLAIMED AND SHALL NOT GOVERN OR APPLY TO THE SOFTWARE PROVIDED IN CONNECTION WITH THIS WARRANTY STATEMENT.

Overview

The HP Storage Works Continuous Access XP (CA) software copies data from a local HP XP disk array to one or more remote HP XP disk arrays. CA may be used for data duplication, migration, and offsite backup.

CA continuously copies data synchronously or asynchronously from a primary source volume known as a P-VOL to a secondary remote volume known as an S-VOL. The primary volumes are always online to hosts at the local site and continue to process read and write operations. In the event of a disaster or system failure at the primary site, you can use the copy of data on the S-VOL to allow user operations to continue. The secondary volumes can also be used as a source for offsite backups and other operations.

The relationship between a P-VOL and an S-VOL is called a pair. You can use CA's paircreate command to establish pairs. Once a pair is established, updates to the P-VOL are automatically and continuously copied to the S-VOL. There are other commands to temporarily suspend copy operations, resync the pair, and delete the pair relationship.

Data transfer from a P-VOL to an S-VOL takes place at high speed over a dedicated ESCON or Fibre Channel (FC) connection. Using ESCON connections, CA can operate across distances up to 43km (26.7 miles). For direct connect Fiber Channel connections, CA can operate across distances of 11km (using single-mode long wave optical fibre cables in a switched

pair configuration) or up to 200km (using wavelength division multiplexing or long haul optical transceivers). CA also supports ESCON and Fiber Channel remote copy over IP networks using protocol converters, which is an inexpensive way to implement remote copying over long distances.

CA can be used in conjunction with HP StorageWorks Business Copy XP, an application that creates multiple copies of volumes within a single disk array. Together these two applications can produce multiple internal and remote copies of data to expand your local and remote backup and recovery options.

CA supports the Logical Unit Size Expansion (LUSE), Volume Size customization (VSC), and Cache LUN features of the array. CA supports all LUN emulation modes, as well as all RAID levels, including different RAID levels between primary and secondary arrays.

CA operations are performed by using a Windows-based graphical user interface (GUI) on the remote console PC or by using the RAID Manager CLI software, which provides a command line interface from hosts attached to the array.

For effective and complete disaster recovery solutions, CA is integrated in many cluster solutions, such as Cluster Extension (CLX) for Windows, Linux, Solaris and AIX, as well as MetroCluster and ContinentalCluster for HP-UX.

Your HP representative can advise you about the many operational modes, parameters and options available. We recommend speaking with HP prior to installation.

CA components

Figure 1 and Figure 2 show the CA components. The major components are discussed on the following pages:

- Disk arrays
- Main and remote control units (MCUs and RCUs)
- Volume pairs (P-VOLs and S-VOLs)
- CA Async consistency groups
- Remote copy links
- Remote and local control ports (RCPs and LCPs) for ESCON interface
- Initiator and RCU target ports for Fibre Channel interface
- Remote console PC
- Host servers (UNIX/PC Servers)
- Host failover software (optional)

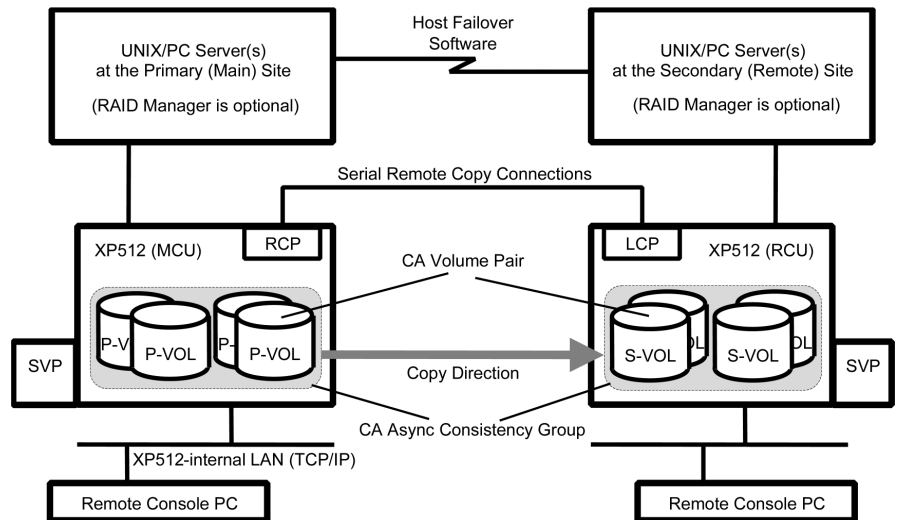


Figure 1. CA components for ESCON connection

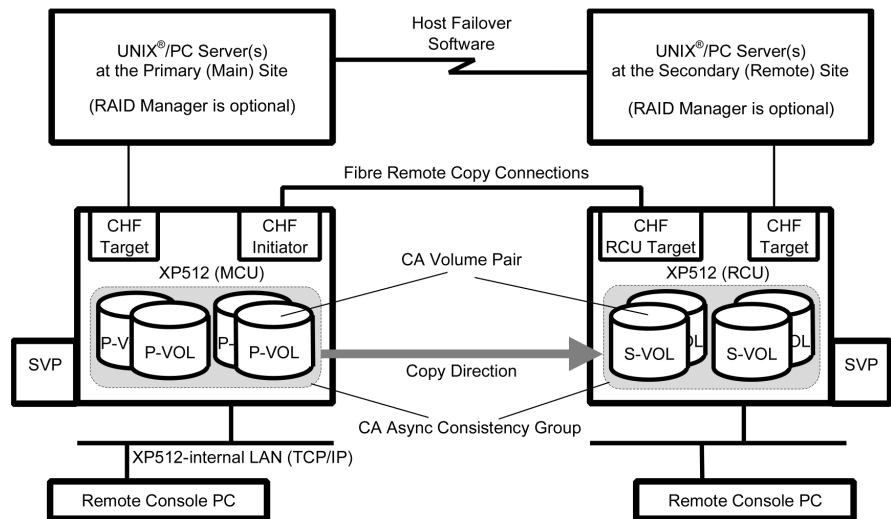


Figure 2. CA components for Fibre Channel connection

Disk arrays

CA copies data from one source disk array to one or more remote disk arrays. The source array, known as the primary array or master control unit (MCU) copies data to the target array, known as the secondary array or remote control unit (RCU). Data always flows from primary to secondary. Primary and secondary array volumes (P-VOLs and S-VOLs) that are tied together to provide replication are known as pairs.

Main and remote control units (MCUs and RCUs)

The MCU controls the P-VOLs of the CA volume pairs. The MCU communicates with the RCU via dedicated ESCON or Fibre Channel remote copy connections.

The MCU controls host I/O operations to the P-VOLs as well as copy operations between the local P-VOLs and remote S-VOLs. The MCU also manages CA pair status and configuration information.

The RCU controls the S-VOLs of the volume pairs and assists in managing pair status and configuration. The RCU executes remote copy operations issued by the MCU. A secondary remote console PC should be attached to the RCU at the remote site. The RCU should also be attached to a host system. This allows sense information to be reported in case of a problem with a secondary volume or remote disk array, and it also provides disaster recovery capabilities (in which the secondary becomes the primary while the primary is down).

The MCU and RCU can be defined separately for each CA volume pair. A disk array can function simultaneously as an MCU for one or more P-VOLs and as an RCU for one or more S-VOLs. This enables two arrays to mirror each other for backup and disaster recovery in both locations.

Volume pairs (P-VOLs and S-VOLs)

CA performs remote copy operations from logical volume pairs created by the user. Each CA pair consists of one primary volume (P-VOL) containing the original data and one secondary volume (S-VOL) containing the backup or duplicate data. During normal CA operations the S-VOL is read-only to the host, and the array will block any write I/O to this device.

You can create a volume pair between any local and remote volumes as long as both devices have the same emulation mode and size. A device can be one of the standard emulation sizes (such as OPEN-3, 8, 9, E, K), or it can be a specially sized device created using LU Size Expansion (LUSE) or Volume Size Customization (VSC). RAID Manager command devices cannot be used in volume pairs. CA operations can be performed only on devices that are allocated to the host port on the system. Both P-VOL and S-VOL must be assigned to a host port.

CA supports a maximum of 4,096 CA volume pairs (the maximum number of LDEVs in an array). When RAID Manager command devices are defined, the maximum number of volume pairs in the disk array is 4096 minus the number of command devices. If CA volume pairs include Logical Unit Size Expansion (LUSE) volumes, then all LUs in the LUSE volume count towards the maximum.

Async-CA consistency groups

Async-CA often produces superior performance compared to Sync-CA. Async-CA requires the use of consistency groups. An Async-CA consistency group is a user-defined set of volume pairs across which update sequence consistency is maintained and ensured at the remote site. Each Async-CA volume pair must be assigned to a consistency group. CA allows you to configure up to 64 consistency groups for each MCU. Consistency groups enable you to maintain update sequence consistency for databases which span multiple volumes, allowing database recovery at the remote site when needed. However, note that Async-CA requires all primary devices in a consistency group (CT) to be located within a single array and all secondary devices to be located within a single array. Consistency groups cannot extend across multiple arrays.

Remote copy links

CA requires dedicated remote copy links between the local and remote array. These links are defined as physical links between the arrays and logical links within array elements.

Physical links can use either an ESCON or a Fibre Channel protocol and can span distances of a few meters to thousands of kilometers when extenders and/or converter units are used (for details see Chapter 2).

The disk array has up to sixteen (0-F) logical control units (CUs), with each CU image controlling up to 256 logical devices (LDEVs). CA allows you to select a CU image within the connected MCU and specify a CU image in the RCU to create a logical path between the devices. Logical links can use one or several physical links to copy data. A maximum of eight physical links can be configured in a logical link configuration. When multiple physical links are configured for a logical link, the array will automatically apply load balancing and failover functions between links.

Logical link configurations support 1-to-n and n-to-1 (where $n \leq 4$) remote copy XP array configurations on a control unit (CU) basis. CU 1 in Array 1 can be linked to four other CUs in another array or in four other arrays.

A physical link is a 1-to-1 connection between two arrays. Maximum physical links are limited only by the number and type of ports on the array. FC and ESCON protocols cannot both be used in a single array pair, but both protocols can be used if an MCU is connected to multiple RCUs.

HP strongly recommends that you establish at least two independent connections (one per cluster (power boundary)) between each MCU and RCU to provide hardware redundancy. It is also strongly recommended that the FC infrastructure be dedicated for Continuous Access. If the FC infrastructure is to be shared, contact your HP representative.

The XP256 disk array can be used as an MCU/RCU connected to an XP512 RCU/MCU for Continuous Access synchronous and /or Continuous Access asynchronous operations using ESCON only. If functionality differences exist between the XP512 and XP256, Continuous Access functionality will be limited to the level of the most limited array.

If you are connecting the XP512 and XP256 disk arrays in a mixed configuration, make sure that each disk array has a unique serial number. If you have two disk arrays with the same serial number, contact your HP account team for assistance before deploying Continuous Access.

ESCON as a physical link

When using ESCON, it is necessary to define a physical link from a Remote Control Port (RCP) on the primary array (MCU) to the Local Control Port (LCP) on the remote array (RCU). The RCP emulates host processor mainframe channels to enable the MCU to send write I/O operations directly to the remote array. The RCP supports the dynamic switching capacity provided by ESCON ESCDs. Any ESCON port of the disk array can be configured as either an RCP or an LCP. The port change window allows you to change the configuration of the disk array ESCON ports from LCP to RCP and from RCP to LCP as needed.

The ESCON local control ports (LCPs) are used for either Continuous Access or mainframe host processor channel interface. All ESCON ports on the disk array have a default setting of LCP. An RCU port connected to an MCU must be in LCP mode to receive remote copy I/O operations from the MCU. ESCON RCP ports cannot communicate with the mainframe host processor channels and are dedicated to CA operations. Mainframe host channel interface paths and CA physical link paths must be connected to separate ESCON interface ports on the array.

The MCU and RCU ESCON ports (CHIP cards) that connect to each other must both be set to the same controller emulation mode.

Fibre Channel as a physical link

When using FC protocol for remote communication, it is necessary to define a physical link from an Initiator port on the local array (MCU) to the Remote Control Target port (RCU Target) on the remote array (RCU). The Initiator port sends write I/O operations directly to the remote array. Any 8HSE Fibre Channel interface port (CHIP) in the disk array can be configured as an Initiator or RCU target port. The port change window allows you to change the configuration of the disk array Fibre Channel

ports between ordinary host target port, initiator port, or CA RCU target port as needed.

For direct array-to-array links over distances shorter than 500 meters, the FC ports must be configured for Fibre Channel arbitrated loop (FC-AL) protocol. Any link using an FC switch configuration must be configured for Fibre Channel point-to-point protocol.

Remote console PC

The remote console PC, which is attached to the disk array by a private LAN, runs the management software for the disk array, including Continuous Access. The remote console PC communicates with the SVP of the attached array.

Both local and remote sites should have a remote console PC attached to the array. The remote console PC at the local site is used to configure the physical links between the arrays and to monitor pair status information. The remote console PC attached to the secondary array enables the user to monitor CA status information and to perform CA operations in the reverse direction from the remote site to the local site during disaster recovery.

Note that if you are using HP Performance Advisor to monitor a disk array, exit PA before connecting to the disk array from the remote console PC. This prevents timeouts from occurring due to heavy LAN traffic on the private network.

Host servers

Host servers (UNIX or PC) connected to the primary device (P-VOL) have full read/write access to the device during normal CA operations. A host connected to the secondary device (S-VOL) does not have write access to the device even though the device is visible to the host. For CA to function, an active host is not required at the primary or secondary array, but disks used as volume pairs must be allocated to array ports.

RAID Manager software can be used on a host to display volume pair status and to initiate operations on CA devices. Volume pairs can be grouped in a configuration file to form device groups so that all actions initiated from RAID Manager will be performed simultaneously on all devices in the group.

Host failover software

Continuous Access and RAID Manager do not provide automated failover functionality. During a failure it is important to detect and react to errors by automatically restarting failed applications on another host. This failover functionality is provided by the cluster software for a specific host operating system. However, standard cluster software requires that devices be available to the host for read/write operations at all times. Since CA S-VOL devices are read-only during normal CA operation and require a "takeover" command to enable them for writing, the standard cluster software alone cannot perform a failover to a CA S-VOL.

The HP Cluster Extension (CLX) and MetroCluster applications work with standard cluster software to enable failover operation with CA. These applications verify the status of devices containing copied data, change copy direction, and prevent application startup on devices with invalid or outdated information. For information about implementing an automated disaster tolerant solution using CLX and MetroCluster, refer to the CLX and MetroCluster user guides or consult your HP representative.

CA volume pair operations

CA operations include actions you can perform with volume pairs. These operations are detailed in Chapter 4 and are briefly described here:

- **Pairedisplay** displays the status of volumes in the selected CU.
- **Paircreate** creates a pair by adding the selected primary and secondary volumes to the pair list in the Pair List window.
- **Pairsplit -R** splits a volume pair temporarily for maintenance purposes, such as to allow I/O writes to the S-VOL. Volumes can also be split (suspended) automatically by CA if it detects an error.
- **Pairsplit -S** splits a volume pair and deletes it from the pair list.
- **Pairresync** restores and resynchronizes a pair after Pairsplit -R

Pair status (pairedisplay)

In the Pairedisplay window, CA displays the pair status of each volume in the selected CU. The MCU maintains the status of the P-VOL and can change the pair status of both the P-VOL and S-VOL. The RCU maintains the status of the S-VOL and can change the pair status of the S-VOL but not the P-VOL. The MCU detects when the RCU changes the S-VOL status and changes the P-VOL status accordingly. The pair status indications are as follows:

- **SMPL** - Volume not assigned to a CA volume pair
- **COPY** - Initial copy for this pair is in progress
- **PAIR** - Pair is synchronized
- **PSUS** - Pair is not synchronized because it was split by the user
- **PSUE** - Pair is not synchronized because it is split due to an error
- **PDUB** - LUSE volume failed and status is uncertain (dubious)
- **Suspending** (async) - Pair in split/suspend transition, unsynchronized
- **Deleting** (async) - Pair in pairsplit -S transition, unsynchronized

Creating a pair (Paircreate)

Using the Paircreate window you select the P-VOL and S-VOL for the pair you want to create, set the initial copy options, and start the initial copy from the P-VOL to the S-VOL. Before you start the paircreate, the status of the two volumes is SMPL. When you start initial copying, the status of the pair changes to COPY. After the initial copy, as long as the two volumes remain synchronized, their status remains PAIR.

The initial copy options you can select are:

- **Priority** - specifies the order in which initial copying is performed.
- **Initial Copy** - specifies whether the initial copy copies the entire volume or none if no initial copy is to be performed.
- **Copy Mode** specifies whether the update copy mode will be **Synchronous** or **Asynchronous** and specifies the consistency group if async update mode is chosen.
- **Initial Copy Pace** specifies the maximum number of tracks (1-15) to copy before the MCU accepts another host request for that P-VOL.
- **P-VOL Fence Level** (Synchronous only) specifies the conditions under which the MCU will reject P-VOL write operations.
- **Error Level (Async)** specifies the error level for async pair(s).

Remote copy operations

Figure 3 illustrates the two types of CA remote copy operations: initial copy and update copy. To maximize data transfer, the disk array uses a link write command exclusive to transfer control parameters and data for consecutive updated records in a single write operation.

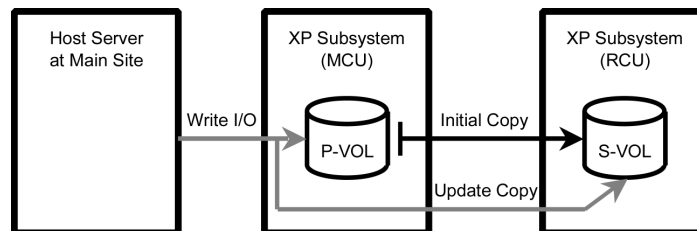


Figure 3. Remote copy operations

Initial copy

The initial full copy operation, which is the same for sync and async pairs, synchronizes the P-VOL and S-VOL. A CA initial full copy operation occurs when you add a pair (paircreate) or resume a split/suspended pair (pairresync). When a new pair is created, the entire contents of the P-VOL are copied to the S-VOL.

Update Copy

An update copy operation occurs when the host issues a write operation to the P-VOL of a CA pair. The update copy operation duplicates the P-VOL write at the S-VOL to keep the volume pair synchronized. CA provides two modes for update copy operations: synchronous and asynchronous. You specify the update copy mode when you create a CA pair. The mode cannot be changed without deleting the pair.

For synchronous update copy mode, the MCU ensures that the P-VOL and S-VOL are synchronized at all times by writing I/O to both the P-VOL and its associated S-VOL at the RCU. When a split or suspended pair is resumed (pairresync), out-of-sync cylinders (altered by write operations to either the P-VOL or S-VOL during split/suspension) are copied to the S-VOL.

When the CA S-VOL write enable function is used, the RCU keeps track of S-VOL updates and sends the S-VOL cylinder bitmap to the MCU when the split pair is resumed. The MCU merges the P-VOL and S-VOL bitmaps to identify the out-of-sync cylinders.

For Async-CA update copy mode, the MCU stores the P-VOL updates along with additional control information in cache, and sends the updates and control information to the RCU completely independent of the host I/O processes. These updates, along with their associated control information, are called Async-CA recordsets. The RCU stores the Async-CA recordsets in cache and performs the updates to the S-VOLs in the same order as they were performed at the MCU according to the CA recordset sequence information.

Pairsplit -R, Pairsplit -S (PSUS) and Pairresync

Sometimes a user needs to split a CA volume pair in order to perform media maintenance on the P-VOL or write to the S-VOL. A CA volume pair can be split by the user at any time after the initial copy operation is complete.

When a Sync-CA pair is split by the user, the MCU completes pending updates, changes the pair status to PSUS and stops updating the S-VOL. When an Async-CA pair is split by the user, the MCU and RCU complete or discard pending updates according to the user-specified drain/purge pairsplit option. The MCU and RCU keep track of any discarded recordsets. The MCU then changes the pair status to PSUS and stops performing recordset operations for the pair.

If any changes occur to the P-VOL or S-VOL during the split, the MCU and RCU keep track of them. When the pair is resumed (pairresync), the RCU sends the S-VOL cylinder bitmap to the MCU. The MCU merges the P-VOL and S-VOL bitmaps to determine which cylinders are out of sync.

The split is indicated at the MCU and/or RCU as follows:

- **PSUS, P-VOL by Operator** - The user split the pair from the MCU using the P-VOL Failure option. S-VOL split type is PSUS, by MCU.
- **PSUS, S-VOL by Operator** - The user split the pair from the MCU or RCU using the S-VOL option.
- **PSUS, by MCU** - The RCU received an MCU request to split the pair. P-VOL split type is PSUS P-VOL by Operator or PSUS S-VOL by Operator.
- **PSUS, Delete pair to RCU** - MCU detected S-VOL status change to SMPL because user deleted the pair (pairsplit-S) from the RCU.

Pair suspension (PSUE)

The MCU suspends a volume pair when it detects any of the following:

- The user has deleted the volume pair
- An error condition in the RCU, S-VOL, or update copy operation
- The MCU is unable to communicate with the RCU
- An Async-CA suspension condition occurs

When a Sync-CA pair is suspended, the MCU stops update copy operations to the S-VOL. If the MCU accepts write I/Os for a suspended P-VOL (which depends on the fence level setting), the MCU keeps track of P-VOL cylinders updated while the pair is suspended. When a suspended sync pair is resumed, the MCU copies the out-of-sync P-VOL cylinders to the S-VOL. CA does not allow access to an S-VOL while the pair is suspended.

When an Async-CA pair is suspended, the MCU stops performing Async-CA recordset operations for the pair. The MCU continues accepting write I/Os for the suspended P-VOL and keeps track of the P-VOL cylinders updated while the pair is suspended. The MCU and RCU also keep track of any recordsets that were discarded during the pair suspension. When a suspended Async-CA pair is resumed, the RCU sends the S-VOL cylinder bitmap to the MCU, and the MCU merges the P-VOL and S-VOL bitmaps to determine which cylinders are out-of-sync. This method ensures that all cylinders which contain recordsets that were discarded at the RCU are resynchronized at this time.

The following are displayed to indicate the cause of a suspension:

- **PSUE, by RCU** - The MCU detected an error condition at the RCU, which caused the MCU to suspend the CA volume pair. The S-VOL suspend type is **PSUE-S-VOL Failure**.
- **PSUE, S-VOL Failure** - The MCU detected an error during RCU communication or an error during update copy. In this case, the S-VOL suspend type is usually **PSUE-S-VOL Failure**. This suspend

type is also used when the number of paths falls below the minimum number of paths setting on the RCU Option window.

- **PSUE, MCU IMPL** - The MCU could not find valid control information in its nonvolatile memory during IMPL. This condition occurs only if the MCU is without power for more than 48 hours (that is, power failure and fully discharged backup batteries).
- **PSUE, Initial Copy Failed** - The CA pair was suspended before the initial (out of order) copy operation was complete. Data on the S-VOL is not identical to the data on the P-VOL.
- **PSUE, MCU P/S OFF (Async)** - The RCU received a request from the MCU to suspend the S-VOL due to MCU power-off. The RCU stops expecting recordsets from that MCU. The P-VOL status does not change due to MCU power-off.
- **PSUS, Sidefile overflow (Async)** - The amount of sidefile exceeds the specified current pending update data rate, and the RCU data is not transferred within the specified offloading timer.

Async-CA suspension conditions

There are additional Async-CA suspension conditions related to recordset operations. Both the MCU and RCU can detect Async-CA suspension conditions and suspend Async-CA pairs. When an Async-CA pair is suspended, the cylinders which contain the following records are marked in the cylinder bitmap as modified (to be copied during the pairresync operation):

- The recordsets that were created by the MCU but not yet sent to the RCU. After marking these P-VOL cylinders as modified, the MCU discards these recordsets.
- The recordsets that were sent to the RCU but not acknowledged by the RCU. The MCU marks these P-VOL cylinders as modified and

discards these recordsets. This ensures that recordsets which are lost during transmission to the RCU are identified and marked.

- The recordsets that reached the RCU but have not yet been settled. After marking these S-VOL cylinders as modified, the RCU discards these recordsets.
- The P-VOL records updated by host-requested write I/Os after the pair was suspended (same function as for Sync-CA pairs).

If a recordset is lost in transmission from the MCU to the RCU, the MCU's cylinder bitmap ensures that the missing recordset is marked. After the MCU sends the recordset to the RCU, the MCU does not remove the sidefile entry for the recordset from its cache until it receives an I/O completion signal (device end) from the RCU.

[Table 1](#) describes the Async-CA suspension conditions and indicates which physical CU detects the condition and which pairs are suspended. The CA offloading timer option and timeout group options are used to control the Async-CA suspension conditions.

Split/Suspension consistency status

A suspended or split Async-CA S-VOL has an additional status called the consistency status. The consistency status is displayed only at the RCU and indicates the S-VOL's update sequence consistency with respect to the other S-VOLs in the same group:

- **Volume** - volume pair was split or suspended alone. Update sequence consistency between this S-VOL and other S-VOLs in this consistency group cannot be trusted for disaster recovery at the secondary site.
- **Group** - volume pair was split or suspended with other pairs in its consistency group. Update sequence consistency between this S-VOL and other S-VOLs in this consistency group can be trusted for disaster recovery at the secondary system after deleting the pair from the RCU.

Table 1. Async-CA suspension (PSUE) conditions

Suspension Condition	Detected by:	Async-CA Pairs to be Suspended
The MCU could not send a pending recordset to the RCU before the offloading timer async option expired.	MCU	All Async-CA pairs with P-VOLs in the MCU.
During MCU power-on, the MCU could not establish communication with the RCU before the RCU ready timeout group option expired.	MCU	All Async-CA pairs with P-VOLs in the MCU.
The RCU could not settle a pending recordset before the copy pending timeout group option expired.	RCU	All Async-CA S-VOLs in the consistency group.
The RCU could not communicate with the MCU before the copy pending timeout group option expired.	RCU	All Async-CA S-VOLs in the consistency group.
The RCU could not receive the recordset successfully due to a hardware failure.	RCU	Only the affected S-VOL.
The RCU detected a logical error while selecting the recordset to be settled.	RCU	All Async-CA S-VOLs in the consistency group, or only the affected S-VOL, depending on the type of failure and the error level Async-CA pair option.
The RCU could not settle the recordset due to a hardware failure, track condition, or logical error.	RCU	

Async-CA consistency group operations

Async-CA consistency groups enable update sequence consistency to be maintained across a group of volumes. The P-VOLs and S-VOLs of the pairs in a consistency group must be located within one physical MCU and one physical RCU (1-to-1 requirement). CA consistency group operations include:

- Group options: copy pending timeout and RCU ready timeout
- Group operations:
 - Split (pairsplit-R) all pairs in a consistency group
 - Resume (pairresync) all split or suspended pairs in a group
 - Delete (pairsplit-S) all pairs in a group
 - Error level pair option (automatic consistency group suspension)

These operations are described in detail near the end of Chapter 3 under the heading “[Async-CA control operations](#)”.

Async-CA recordset operations

Async-CA recordsets contain P-VOL updates and associated control information, including the sequence number of the P-VOL update. These recordsets are employed by the RCU to maintain update consistency of the S-VOLs in the same sequence as the updates to the P-VOL. Async-CA recordset operations include:

- Creating and storing recordsets at the MCU
- Sending recordsets to the RCU
- Storing recordsets at the RCU
- Selecting and settling recordsets at the RCU
- Data and control recordset types
- Inflow control for sidefiles (control of recordset flow into cache)

Creating and storing Async-CA recordsets at the MCU

When an MCU performs an update (host-requested write I/O) on a Continuous Access Asynchronous P-VOL, the MCU creates a recordset which contains: the updated record, sequence number, record location (device, cylinder, track, record number), and record length. The Async-CA recordsets are queued in the cache storage of the MCU and sent to the RCU independent of host I/O processes. The RCU utilizes the sequence number information in the recordsets to update the S-VOL(s) in the same order as the P-VOL(s).

The sequence number indicates the number of recordsets that the MCU has created for each consistency group. The recordset information, except for the updated records, is stored and queued in a variable-sized area of cache known as sidefile cache.

Continuous Access Asynchronous operations continue uninterrupted if the SVP reboots or fails.

Sending Async-CA recordsets to the RCU

The MCU sends the Async-CA recordsets to the RCU in a similar manner as Continuous Access synchronous updates. The MCU's RCP or initiator ports act as host processor channels and issue special I/O operations, called remote I/Os (RIOs), to the RCU. The RIO transfers the recordsets in FBA format (not CKD) using a single channel command, eliminating the overhead associated with FBA-CKD conversion and thus providing more efficient transfer of data. The MCU can send several recordsets using a single RIO, even if their sequence numbers are not contiguous. Therefore, Async-CA recordsets are usually sent to the RCU in a different order than the arrivals at the MCU. The RCU ensures that records are applied to the S-VOLs in the correct sequence. This method of remote I/O provides the most efficient use of MCU-to-RCU link resources.

The parameter length and detailed specification of the Continuous Access Asynchronous channel command are different than for Continuous Access Synchronous RIOs. You must make sure that your channel extenders (e.g. CNT's Edge) are capable of supporting this command. For further details, please contact your HP account team.

Storing recordsets at the RCU

The RCU maintains queues to control the storing of recordsets in the sidefile and commitment of updating records in the S-VOLs. The RCU uses sequence numbers provided by the MCU to check for missing updates.

The MCU does not remove the sidefile entry for a recordset from its cache until it receives an I/O completion signal (device end) from the RCU. This is true even if the MCU and RCU are connected via a channel extender product (e.g. CNT). If a recordset is lost in transmission from the MCU to the RCU, the MCU's cylinder bitmap ensures that the missing recordset is identified and resent to the RCU.

Selecting and settling recordsets at the RCU

The RCU selects the recordset to be resolved as formal data and saved on disk (or “settled”) as follows:

1. The RCU checks for a valid entry at the top of each queue in the consistency group. If the top of any queue is empty (i.e., recordset not yet received), the RCU waits for that entry.
2. When the top of each queue contains a valid entry (recordset), the RCU selects the entry which has the earliest sequence number, and then settles (resolves) this recordset.
3. The RCU repeats steps (1) and (2) to select and settle Async-CA recordsets.

Figure 4 illustrates recordset selection and settling (that is, sending it to or designating it as write cache to be destaged to disk) at the RCU. In this example, the top of the queue contains a valid entry: S1. The RCU selects recordset S1 to be settled, because S1 is the earliest. When S1 is removed from the MCU queue, recordset S2 becomes the top entry, but it is empty. When recordset S2 arrives, the RCU selects S2 as the next recordset to be settled. The recordset selected by the RCU is marked as “host-dirty” and treated as formal data. The RCU settles the updated records in the recordset as follows:

- If the corresponding track is in cache (track-hit), the updated records in the recordset are copied to the existing cached track, and the cache space for the sidefile is released.
- If the corresponding track is not in cache (track-miss), the RCU changes the cache designation of the sidefile to formal data. The data is not physically moved.

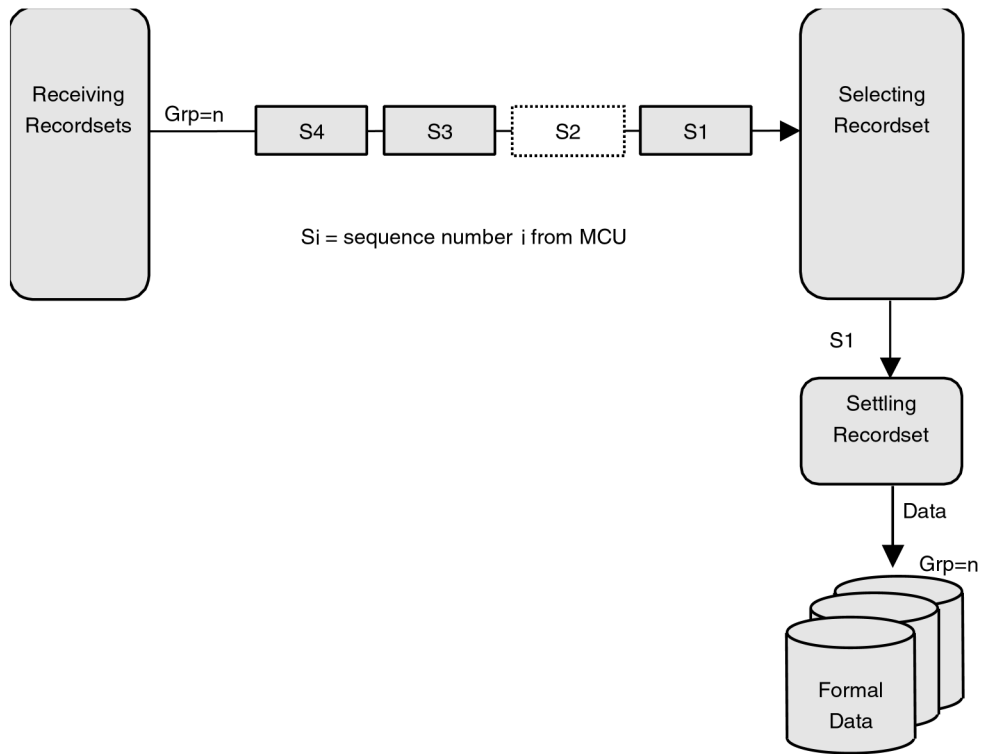


Figure 4. Selecting and settling Async-CA recordsets at the RCU

Types of recordsets

In addition to host update recordsets, the MCU passes control information to the RCU in special non-update recordsets. These special recordsets indicate when volume pair status changes and when an MCU power-off sequence is initiated, and also maintain sequence numbers in periods of low host activity.

Inflow control of recordsets

As described in the previous sections, both the MCU and RCU create sidefiles for storing Continuous Access Asynchronous recordsets. Since the sidefiles occupy exclusive space in cache, both the MCU and RCU perform inflow control to prevent an overload of the disk array's cache resources. The disk arrays use the following parameters for Continuous Access Asynchronous cache inflow control, and the Continuous Access Async Option window allows you to modify these parameters:

- Sidefile (Continuous Access) threshold = maximum cache % available for use by Async-CA sidefiles.
- Offloading timer = maximum time between Continuous Access Async recordset transfers.

The offloading timer value should be set lower than the host bus adapter (HBA) timeout value. When channel-extenders are used for Continuous Access Asynchronous, the offloading timer should be set to 35 seconds or less to avoid affecting host I/O performance.

Inflow Control by MCU

See [Figure 5](#). When the amount of MCU sidefile cache reaches the user-specified threshold, the disk array's I/O response has already been delayed according to the percent of cache consumed. If the MCU is then not able to send a recordset to the RCU within the user-specified offloading timer value, the MCU suspends all affected Continuous Access Async volume pairs releases the sidefile cache.

Inflow Control by RCU

When the amount of RCU sidefile cache reaches the user-specified threshold, the RCU responds with channel-command-retry requests to the RIO commands which transfer the recordsets from the MCU. The only recordset accepted by the RCU is the recordset with the sequence number required to continue settling the pending recordsets. If the RCU is not able to settle a recordset within the user-specified offloading timer value, the RCU suspends all Continuous Access Asynchronous volume pairs and resets the channel-command-retry condition to avoid hanging up the MCU.

Table 2 shows the sidefile threshold values for Continuous Access Asynchronous operations and write pending operations and describes the actions that occur when each threshold is reached.

Table 2. Sidefile thresholds

Operation	Threshold(s)	Action(s)
Continuous Access Asynchronous	Sidefile threshold = 50%. Threshold can be adjusted using the HP Continuous Access remote console software (30, 40, 50, 60, 70%).	MCU reaches threshold: I/O delay. RCU reaches threshold: command retry to MCU.
Write Pending	$[\text{write pending}] / [\text{avail cache} - \text{sidefile}] = 70\%$	Command retry.

Cache LUN (aka DCR) operations decrease the total amount of cache available for Continuous Access Asynchronous operations but do not directly affect sidefile cache usage. Available cache is defined as the amount of physical cache memory installed on the disk array minus any cache reserved for the Cache LUN feature.

Figure 5 shows the graduated delay process for CA XP sidefile management. When the sidefile value reaches the high-water mark (fixed), the disk array begins command retry delay for host updates to P-VOLs. As the amount of sidefile increases, the delay increases incrementally. This graduated delay methodology minimizes the potential for sidefile overcommitment, while at the same time providing another level of automation control.

If there is a network problem, lack of bandwidth, or lack of sufficient Fibre or ESCON links, the sidefile may grow and the microcode may add delay to host I/O until the sidefile goes below a certain level again. Disabling this function will cause the pairs to suspend.

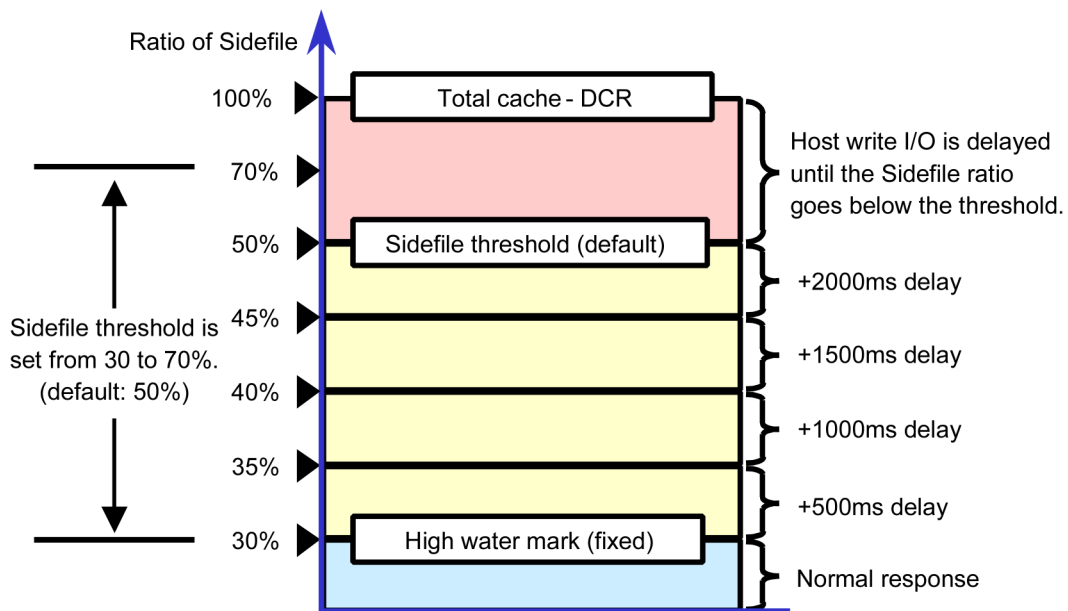


Figure 5. Graduated delay process for sidefile management

Optimizing CA and disk array performance

CA operations increase use of the disk array's channel resources because of the additional write (remote copy) operations to the secondary volumes. Exactly how disk array performance is affected depends on whether you use the sync-CA or async-CA update copy mode.

Sync-CA copy mode

Sync-CA copy mode increases service and disconnect time for write I/Os to CA P-VOLs. This occurs because of the delay between channel-end and device-end. The length of this delay increases as the distance between the P-VOL and S-VOL increases, so the longest delay occurs when these volumes are the maximum distance apart.

Async-CA copy mode

Async-CA copy mode eliminates delays associated with Sync-CA operations while providing increased protections for write-dependent applications in the event of a disaster. Write I/Os for Async-CA P-VOLs are processed in the same way as writes for simplex (SMPL) volumes, without any increase in service or disconnect time. The Async-CA S-VOL updates are performed completely independent of all host I/O processes at the P-VOLs, and there are no restrictions on subsequent read/write operations to Async-CA P-VOLs.

The only performance concerns for Async-CA are:

- Ensuring that adequate cache resources are available for sidefiles which are used to store the recordsets at both the MCUs and RCUs.
- Ensuring that sufficient ESCON paths are defined for copy operations. For distances longer than 10km, Async-CA has the better throughput.

Other factors affecting disk array performance

In addition to the CA update copy mode, several other factors can also affect disk array performance. You can optimize both the CA operations and the I/O performance of the disk arrays by analyzing workloads and addressing system-level conditions that affect disk array performance (such as the number of ESCON paths).

You can also control the impact of CA operations on disk array performance by selecting the appropriate RCU options for each MCU and the appropriate update copy mode (sync-CA or async-CA) and pair options for each CA pair. In addition, you can upgrade the CA hardware components and/or adjust the configuration of the components to improve disk array performance under a wide range of operating conditions.

The following table lists conditions that affect disk array performance and provides recommendations for addressing these conditions.

Table 3. Optimizing CA operations and disk array performance

Condition	Description	Recommendation(s)
Write-intensive workloads	Write-intensive workloads, such as database logging volumes, can have a significant impact on disk array I/O response times.	Spread write-intensive data across several volumes to minimize queuing.
Large block size	Workloads with large write block sizes, such as DB deferred writes, can impact performance.	Spread workloads with large write block sizes across several volumes.
High host channel demand	The demand on the MCU's host channels can affect performance.	Spread the workload across several disk arrays to utilize additional channels.
Sequential write operations	CA operations can have a negative impact on workloads with a high percentage of sequential write operations, such as batch processing operations (for example, dump/restore, sort operations).	Avoid performing restore operations to volumes which belong to CA pairs. Instead, restore data to a scratch volume and then create the CA volume pair.

Cache size	<p>Large cache size improves read hit performance, which allows more disk array resources to be devoted to write operations. The resulting performance improvement can offset some or all of the performance loss due to the CA remote copy operations.</p> <p>Async-CA (and HXRC and Concurrent Copy) require additional cache for sidefile data. Insufficient cache resources can result in command retries, status-change-pending (SCP) notifications, and puncture conditions.</p>	<p>Consider increasing the cache size of the CA disk arrays to handle cache sidefile operations and to improve overall disk array performance. For best results, the cache and NVS capacity of the primary and secondary disk arrays should be the same (for Async-CA the RCU sidefile requirements are twice that of the MCU) to enable the remote site to function adequately during disaster recovery.</p>
RCU capacity	<p>The performance of the RCUs directly affects the performance of the MCUs. If an RCU becomes overloaded with heavy update activity, MCU and system performance can also be degraded.</p>	<p>Distribute CA remote copy operations among several remote disk arrays to avoid overloading any one RCU.</p>
Paths	<p>An inadequate number of paths may decrease disk array performance. Performing Sync-CA operations over long distances can also degrade performance. Async-CA is recommended for long distances.</p>	<p>Make sure to install an adequate number of paths between the primary and secondary disk arrays. This is especially important for disk arrays which contain both P-VOLs and S-VOLs.</p>

Using CA with other data management features

CA supports operation with the following data management features:

Logical Unit Size Expansion (LUSE)

LUSE volumes can be assigned to CA pairs, provided that the P-VOL and S-VOL have the same emulation type and the same number of LDEVs. If you need to perform LUSE operations on an existing CA P-VOL or S-VOL, you must delete the pair first to return the volume to SMPL status.

Volume Size Configuration volumes

VSC volumes can be assigned to CA pairs, provided that the S-VOL has the same capacity as the P-VOL. If you need to perform VSC operations on an existing CA P-VOL or S-VOL, you must delete the pair first to return the volume to SMPL status.

Cache LUN

Cache LUN volumes can be assigned to CA pairs, and Cache LUN operations can be performed on CA P-VOLs and S-VOLs. Some CCI reverse restore operations will interact with Cache LUN BC LUNs.

HP Secure Manager

HP Secure Manager operations do not affect CA operations. Volumes under secure ports or assigned to World Wide Name (WWN) groups or LUN groups can also be assigned to CA pairs. Volumes assigned to CA pairs can also be assigned to secure ports, WWN groups, or LUN groups for HP Secure Manager.

Business Copy

Business Copy (BC) volumes can be assigned to CA pairs, and CA volumes can be assigned to BC pairs.

BC is recommended for intra-disk array copy operations. If BC is not installed, CA (synchronous only) can be used to copy within the same disk array. This configuration requires at least one external ESCON or fibre cable loop.

Using CA with BC

CA and BC can be used together in the same disk array and on the same volumes to provide multiple copies of data at the primary and/or remote sites. [Table 4](#) describes the host pair status reporting for CA volumes, BC volumes, and CA/BC shared volumes.

For shared CA/BC volumes, the CA pair status is reported to the host if you query the CA P-VOL or S-VOL. To obtain the BC pair status, query the P-VOL of the BC pair.

BC supports multiple S-VOLs for each P-VOL. If you issue a pair status query to a BC P-VOL (such as pairdisplay), the status for only one BC pair is reported (the pair with the S-VOL with the lowest LDEV ID). To obtain the pair status for the BC pair(s) with the other S-VOL(s), you must direct the host query to the specific S-VOL using the S-VOL's LDEV ID in the host command. The BC remote console software displays the LDEV ID and BC pair status of all S-VOLs associated with a P-VOL.

Table 4. Host pair status reporting for CA/BC shared volumes

Number of CA Pairs	Number of BC S-VOLs	Pair Status Reported by XP512/48
0	0	Simplex (SMPL)
0	1	BC pair status
0	2 or more	BC pair status for the pair whose S-VOL has the lowest LDEV ID

1	0	CA pair status
1	1	CA pair status
1	2 or more	CA pair status

Figure 6 shows an example of a CA P-VOL, which is also functioning as a BC P-VOL. This configuration allows you to use BC for on-site data backup in case of a CA failure, and to use CA to provide remote backup of the BC P-VOL in case of a BC failure.

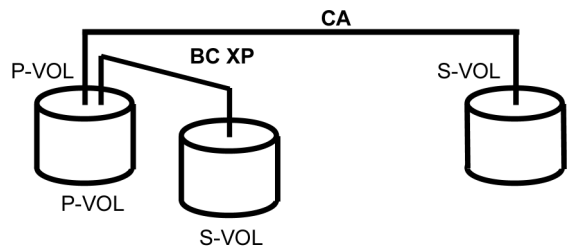


Figure 6. Shared CA P-VOL/BC P-VOL

Figure 7 shows an example of a CA S-VOL which is also functioning as a BC P-VOL. This configuration allows you to use BC to provide multiple backup copies of a single CA P-VOL.

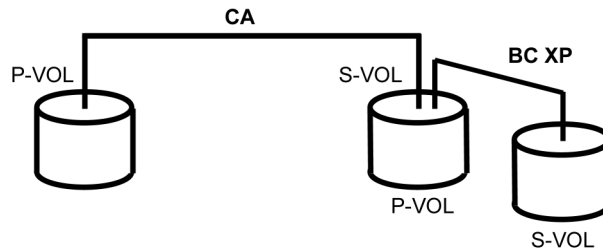


Figure 7. Shared CA S-VOL/BC P-VOL

Figure 8 combines the two previous configurations. Within a single CA pair, the P-VOL and S-VOL are both functioning as BC P-VOLs, providing multiple copies at the primary and remote sites.

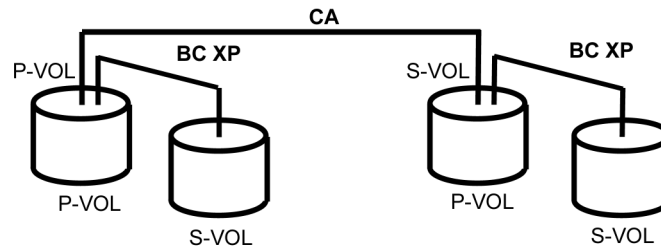


Figure 8. Shared CA/BC P-VOL with Shared CA S-VOL/BC P-VOL

Figure 9 shows an example of a BC S-VOL which is also used as a CA P-VOL.

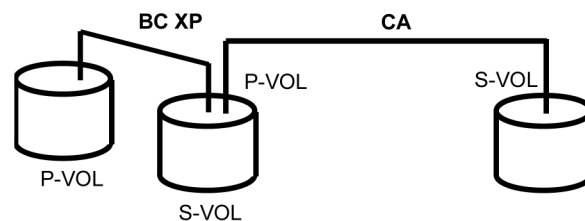


Figure 9. Shared BC S-VOL/CA P-VOL

The configuration in [Figure 9](#) requires that the BC pair be established in duplex mode (PAIR) and then split (PSUS) before the CA pair is created and that only one be in PAIR status at any time. Due to the restrictions involved in this configuration (for example, the BC and CA instances cannot both be in PAIR status at the same time), consult your HP representative for assistance.

Using CA with HP Performance Advisor

Performance Advisor (PA) can be used to monitor the disk arrays performing CA operations. PA provides detailed information on the I/O activity and hardware performance, allowing you to tune the disk array's duplex write (DW) cache setting. Additionally, PA can help:

- Identify the best times to perform CA data duplexing operations (such as periods of light system I/O activity)
- Adjust the disk array cache settings to accommodate CA operations (for example, increase DW cache during CA initial copy operations)
- Determine the best locations for the CA S-VOLs (such as array groups with less frequently accessed volumes)
- Monitor disk array performance during CA operations and during testing activities.

PA data collection does not affect disk array operations, but its data collection activities can cause significant traffic on the disk array LAN, especially when it is collecting LDEV data or data from multiple arrays. To prevent timeouts during CA (or other) operations, first turn off PA LDEV data collection and/or disconnect PA from some or all of the disk arrays. See the PA online help for specific instructions.

2

Installation

The chapter describes installation requirements and procedures, as well as how to start operations for the first time.

Installing the hardware

You and the HP representative install the CA hardware. The hardware configurations for Sync-CA and Async-CA are the same.

1. **You:** Identify the locations of the CA primary volumes on the local array and the CA secondary volumes on the remote array. Both must be the same emulation type.
2. **You and HP representative:** Install the remote console PC near the local array, and connect it to the the disk array using the array's private LAN. HP recommends that you also install a remote console PC connected to the array at the remote site. If you are using CA for disaster recovery, a remote console PC at the remote site is required.
3. **HP representative:** Make sure that the MCUs and RCUs are properly configured for CA operations. Make sure that the desired SVP modes are enabled. Make sure adequate cache and NVS is installed for both CA data and Cache LUN data.
4. **HP representative:** Make sure the MCUs are configured to report sense information to the host(s). The RCUs should also be attached to a host server to enable reporting of sense information in case of a problem with an S-VOL or RCU.

If the remote site is unattended, the RCUs should be attached to a host server at the primary site, so that the system administrator can monitor the operational condition of the RCUs.

5. **HP representative:** If power sequence control cables are used, set the power select switch for the cluster to LOCAL to prevent the MCU from being powered off by the host. Make sure the RCU will not be powered off during CA operations.
6. **HP representative:** For ESCON connections, install the ESCON Port Adapter features. For example, the 8-port adapter (pair of 4-port CHE cards, 1 card per cluster) provides eight ESCON links. If the MCU and RCU are multiplatform disk arrays, there may be available ESCONs, and additional ESCON Port Adapter features may not be required. For Fibre Channel connections, install the Fibre Channel Adapters.

7. **HP representative:** Install the CA remote copy connections between the MCU(s) and RCU(s). This hardware (ESCON cables, ESCON directors, fiber optic cables, switches, etc.) is supplied by the user. Distribute the paths between different storage clusters and ESCDs or switches to provide maximum flexibility and availability. The logical paths between the MCU and RCU must be separate from the logical paths between any mainframe host and the RCU (although they may share some physical paths). Serial or Fibre Channel remote copy activities between two disk arrays (such as Sync-CA and Async-CA) can share the same serial or Fibre Channel remote copy connections.

ESCON remote copy connections

Figure 10 shows the ESCON remote copy connection configurations. The MCU and RCU of each pair must be connected via multimode ESCON cables. For distances greater than 3 km, single-mode cables up to 20 km in length and IBM 9032/9033 ESCDs and/or 9036 ESCON repeaters are required.

The IBM 9032/9033 ESCD supports the extended distance facility (XDF), which uses single-mode ESCON cables up to 20 km.

The IBM 9036 ESCON repeater supports single-mode to single-mode connections or single-mode-to-multimode connections. When CA disk arrays are more than 9 km apart, the XDF connections provided by the ESCDs or ESCON repeaters are required.

CA operations can be performed at distances of up to 43 km (26.7 miles) using standard ESCON support. Long-distance solutions are provided using approved channel extenders and communication lines.

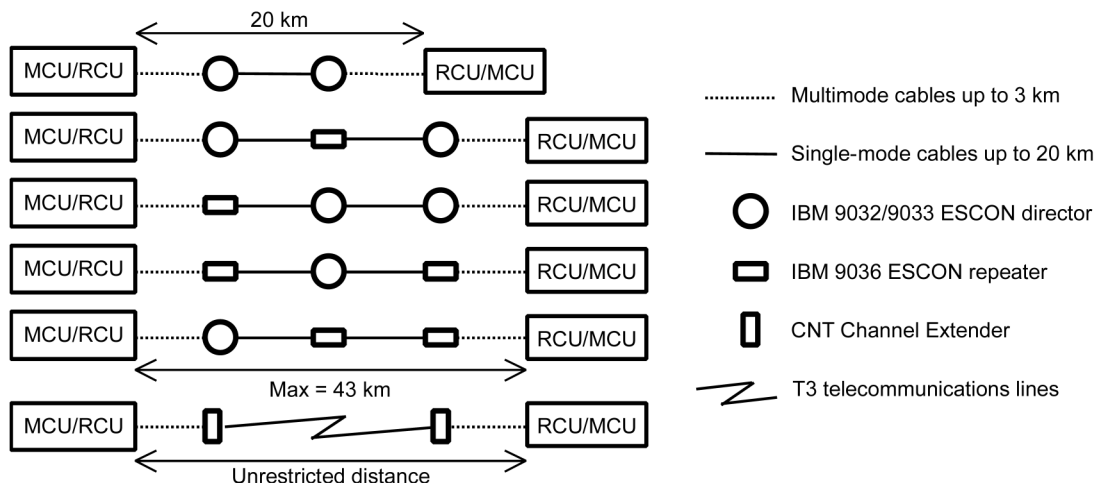


Figure 10. ESCON remote copy connection configurations

Dedicated ESCON channels may be installed, or existing ESCON channels connected by ESCDs may be used. The logical paths between the MCU and the RCU must be separate from the logical paths between any mainframe host and the RCU. All remote copy activities between two disk arrays can share the same physical remote copy connections.

The ESCDs can accommodate multiple MCU-RCU remote copy connections (see [Figure 11](#)). Remote copy connections in n-to-1 or 1-to-n arrangements (where $n \leq 4$) can also be configured by using the dynamic switching capability of the ESCDs to share the physical interface cables between the components (see [Figure 12](#)). The ESCDs can accommodate mainframe channel-to-MCU and mainframe channel-to-RCU connections in addition to the remote copy connections (see [Figure 13](#)).

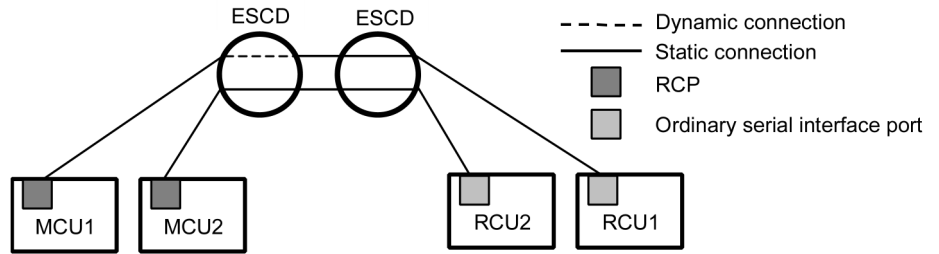


Figure 11. n pairs of remote copy connections

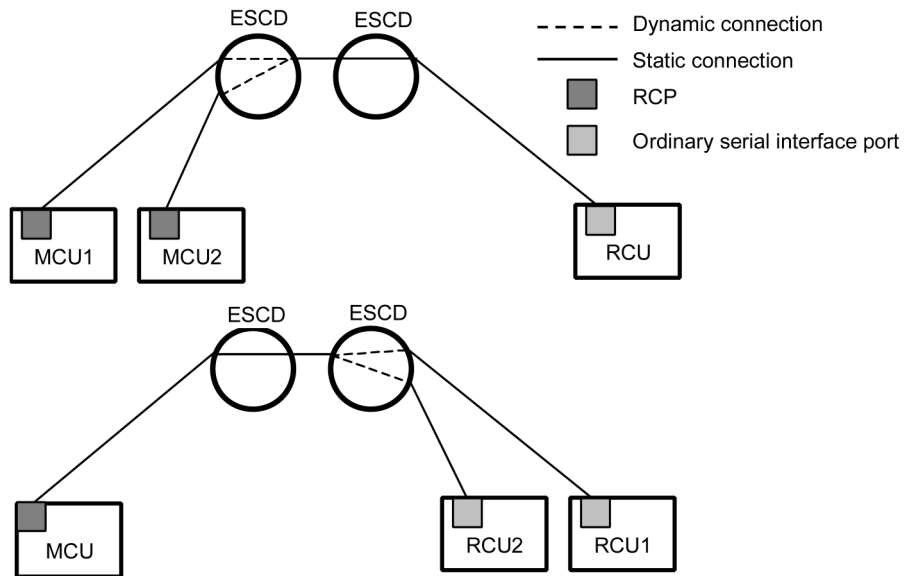


Figure 12. n -to-1 and 1-to- n remote copy connections (where $n \leq 4$)

1-to- n configurations (one main disk array and multiple remote disk arrays) are valid for Async-CA, as long as a consistency group does not span remote disk arrays.

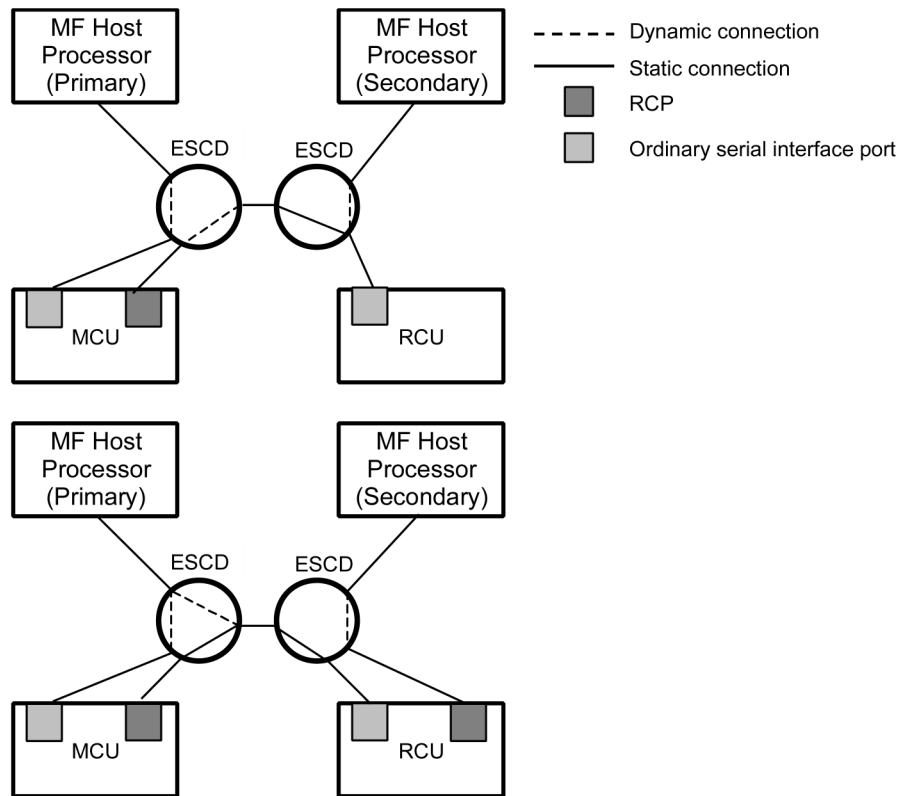


Figure 13. Remote copy connections shared with mainframe channel-to-RCU connections

Channel extenders for ESCON CA

Async-CA can be integrated with third-party channel extenders to provide remote copying to arrays at distances greater than 43 km. Contact HP for the latest information on channel extender support for CA.

- CA has been tested with the CNT UltraNet Storage Director:

UltraNet supports T3 and ATM (Async-CA transfer mode) communication lines.

UltraNet supports ATM OC-3 (optical carrier) levels. The transfer speed of OC-3 is a maximum of 155 Mb/s.

The transfer speed of T3 is a maximum of 44 Mb/s.

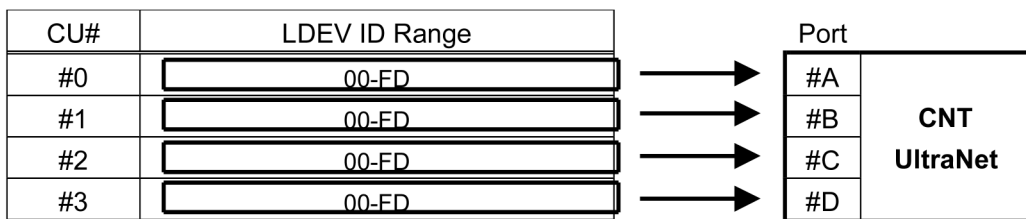
- The disk array serial numbers must be set on the channel extenders as follows. If the serial numbers are not set correctly, the paircreate operation will terminate with an error. For CNT UltraNet, this operation must be performed by the CNT representative.

Set the RCU serial number in the MCU-side extender.

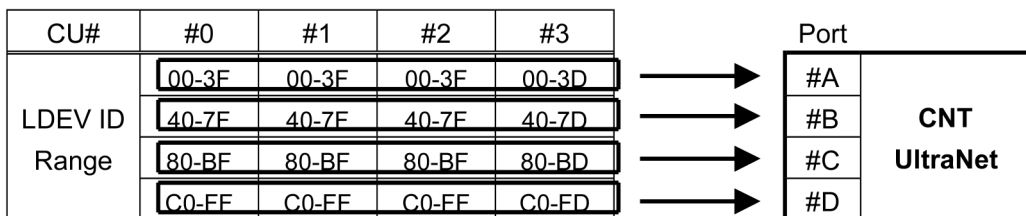
Set the MCU serial number in the RCU-side extender.

Set the serial number on each CNT UltraNet port.

- Make sure that your channel extenders are capable of supporting the Async-CA channel commands. The parameter length and detailed specification of the Async-CA channel commands are different than for Sync-CA RIOs.
- The LDEV IDs of the S-VOLs must be assigned on each port of the MCU-side extender. The maximum number of LDEVs which can be assigned on each port is 254. [Figure 14](#) shows the required LDEV assignment on each extender port. If the LDEV IDs are not assigned properly, the CA paircreate operation will terminate with an error. For CNT UltraNet, this operation must also be performed by the CNT representative.



Example 1: Assigning the same LDEV IDs of a specific CU number to each port.



Example 2: Assigning specific LDEV IDs on each CU number to each port.

Figure 14. Assigning S-VOL LDEV IDs to the channel extender ports

Fibre Channel remote copy connections

Figure 15 shows the remote copy connection configurations for Fibre Channel CA operations. The MCU and RCU of each CA pair must be connected using multimode shortwave fiber optic cables. Fiber cables up to 1.5 km in length (in 500m segments) and up to two switches are required for distances greater than 0.5 km. If you use single-mode longwave fiber optic cables between two switches, distances can reach 11km. Long-distance solutions are provided using approved channel extenders and communication lines.

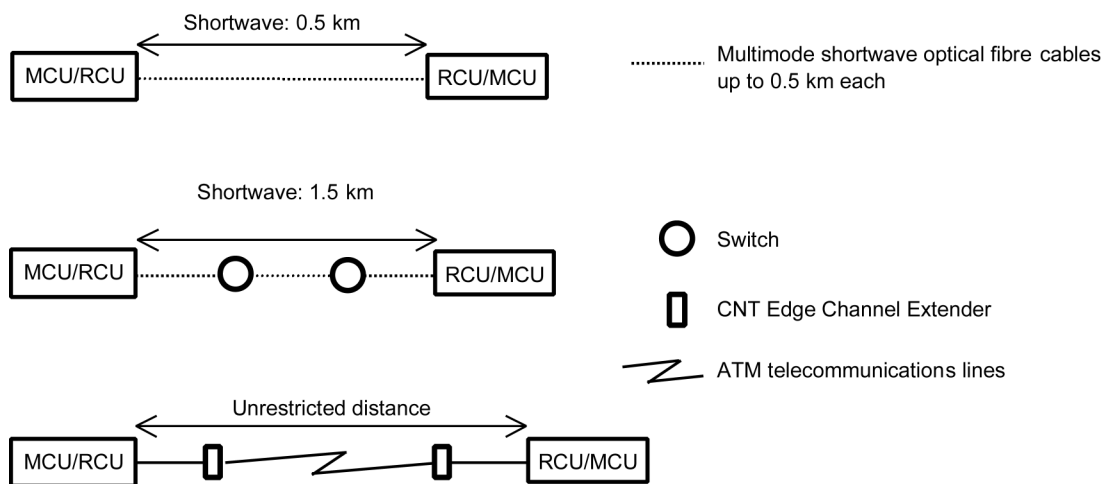


Figure 15. Fibre Channel remote copy connection configurations

CA over IP

CA now supports Fibre Channel remote copy over IP networks, allowing you to implement CA across geographically dispersed locations using inexpensive IP networks. Contact HP for details.

Fibre Channel connections

For Fibre Channel connections you can use ordinary switch connections with no special settings. Three configurations are possible:

- **Direct connection** (see [Figure 16](#)): To set ports for direct connection (up to 500 meters), use LUN Manager and set port topology to Fabric off, FC-AL.:
- **Switch connection** (see [Figure 17](#)): Up to three fiber optic cables are connected together using switches to connect the arrays. Up to two switches can be used. CA paths through a shared switch must be zoned.
- **Extender connection** (see [Figure 18](#)): Channel extenders (CNT Ultranet or Edge extenders) and switches are used to connect an MCU and an RCU across large distances.

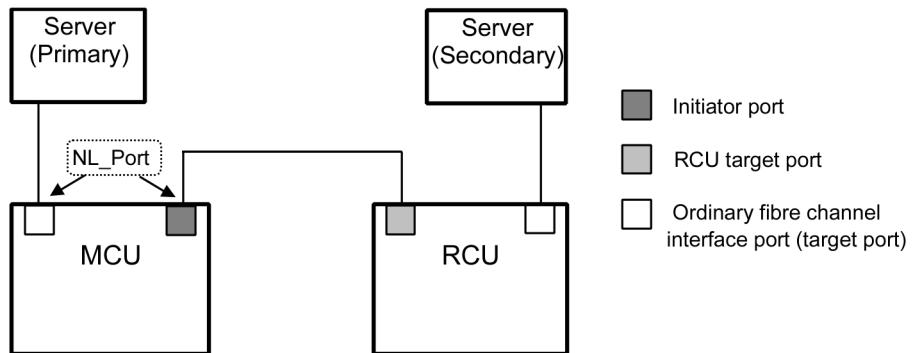


Figure 16. Fibre Channel direct connection (NL_Port) up to .5km

To set ports, use LUN Manager and set port topology to Fab off, FC-AL.

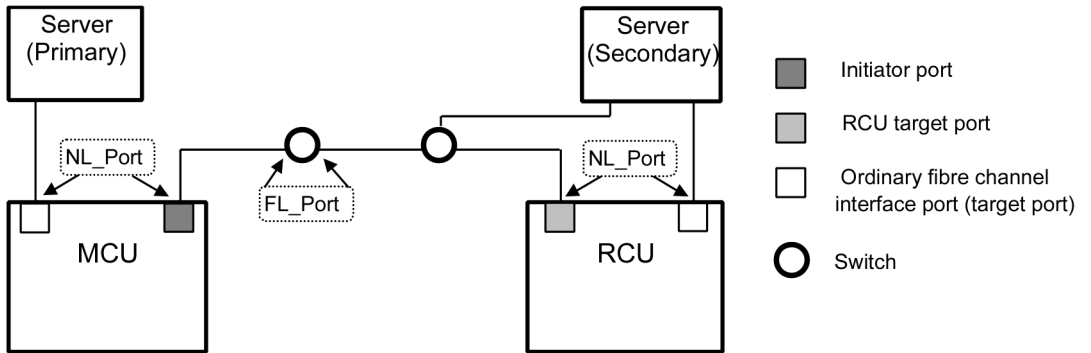


Figure 17. Fibre Channel switch connection (NL_Port or N_Port) up to 11km

Some switch vendors require F port (for example, McData ED5000).

To set ports, use LUN Manager and set port topology to:

- NL port: Fab on, FC-AL
- N port: Fab on, Point-to-Point

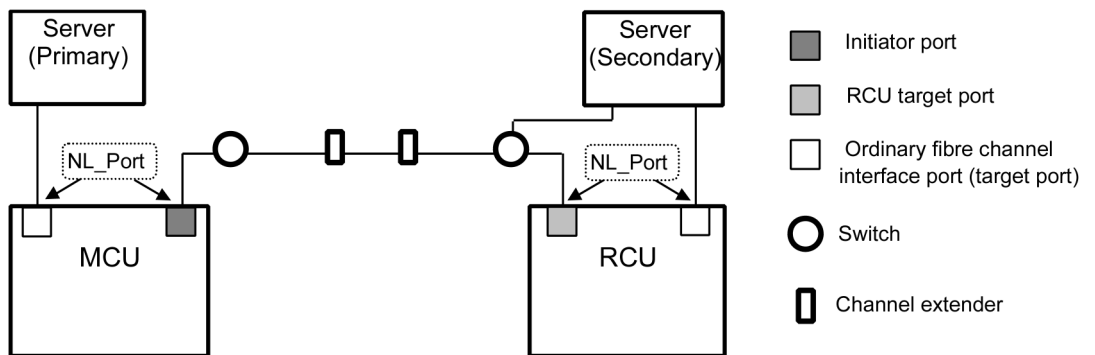


Figure 18. Fibre Channel (CNT USD or Edge) extender connection.

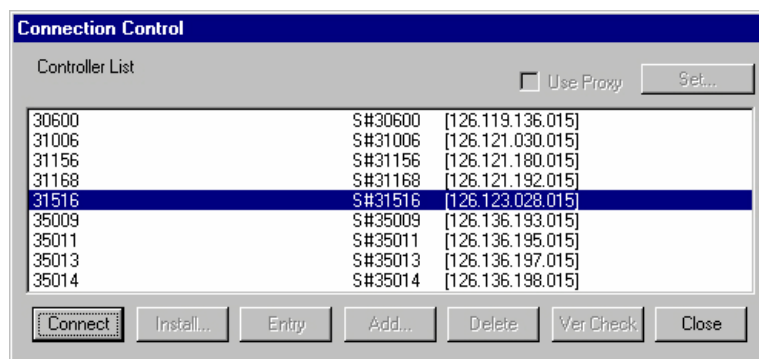
To set ports, use LUN Manager and set port topology to:

- NL port: Fab on, FC-AL
- N port: Fab on, Point-to-Point

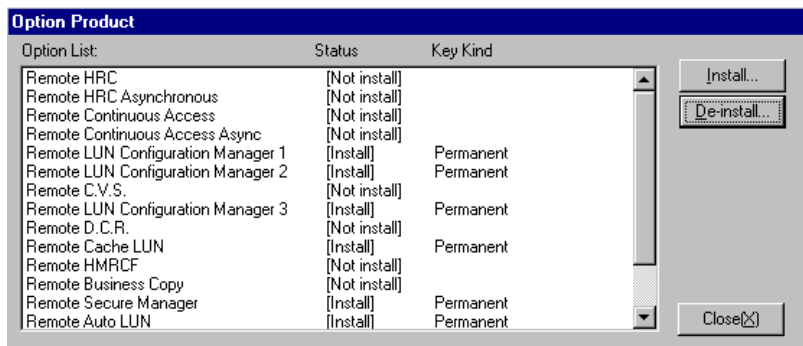
Installing the software

Your HP representative initially installs the CA license keys. You then install the corresponding remote license keys from the remote console PC.

1. Log in as an administrator.
2. On the Remote Control main window, click **Controller**. A list of disk arrays displays.



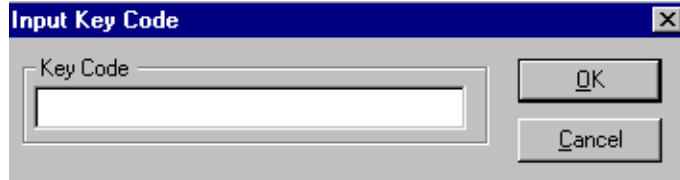
3. Select the disk array that you want to install the key for, and click **Install**. The Option Product window opens.



This window shows the current installation status of the Remote Control options.

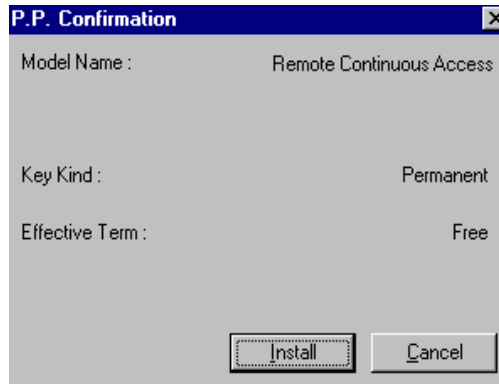
4. Select **Remote Continuous Access** from the Option List.
5. Click the **Install** button. The Input Key Code window opens.

6. Enter the license key in the Input Key Code text box.



7. Click **OK**.

If the password is approved, the Program Product window opens. This window shows the product name, model name (for example, P-242R-E4241), key type (for example, Permanent), and effective term (for example, Free).



8. After confirming the content of the Program Product window, click **OK**.

When this option installation is complete, the Option Product window opens. The status of the selected option changes from [Not install] to [Install].

9. Click **Close** to return to the Remote Control main window.

Configuration

This chapter explains how to configure the CA components. Configuration requires that you do the following operations in the following order:

- Selecting the CU image
- Configuring MCU and RCU ports
- Adding RCUs to the MCU CU image
- Setting RCU options
- Setting RCU path parameters
- Adding logical paths
- Viewing RCU status (to verify settings)
- Configuring Async-CA options

The HP Continuous Access main control window is presented first because all configuration and operation begins with this window.

See [Chapter 4](#) for CA volume pair operations, such as creating pairs, splitting and resyncing pairs, and viewing pair status.

HP Continuous Access main control window

The HP Continuous Access main control window displays the CA information for the selected CU image of the connected disk array and provides access to all CA functions.

HP Continuous Access

CU S/N: 05534

RCU List

S/N	CU	SSID	Path
35005	F	00F0	Fib

Add RCU...
Edit Path/SSID...
Delete RCU
RCU Option...
RCU Status...

MCU List

S/N	CU	SSID	Path
11111	0	0004	Fib

Refresh

Volume List

Port	ID	LUN	Vol	Type	Status	SEQ	Sub	S/N	SSID	Port	ID	LUN	Vol	Path	Fence	Grp(Lv)
1A	00	00	0:00	-----	SMPL											
1A	00	00	0:20	-----	SMPL											
1A	00	00	0:40	Sync(P)	COPY			35005	00F0	2R	00	C7	0:BF	Fib	Never	
1A	00	00	0:80	Sync(P)	PAIR			35005	00F0	2R	00	A7	0:9F	Fib	Data	
1A	00	00	0:80	Asyn(P)	PSUS			35005	00F0	2R	00	87	0:7F	Fib	Never	00(Grp)
1A	00	00	0:A0	Asyn(S)	PSUE	SEQ	OFF	11111	0004	1A	0F	A0	0:5F	Fib	Never	20(LU)
1A	00	00	0:C0	-----	Deleting											
1A	00	00	0:ED	Asyn(S)	Suspending			11111	0004	1A	0F	ED	0:1F	Fib	Never	20(Grp)
1B	01	01	0:01	-----	SMPL											
1B	01	01	0:21	Sync(P)	COPY			35005	00F0	2Q	00	EB	0:DE	Fib	Data	
1B	01	01	0:41	Sync(P)	PAIR			35005	00F0	2Q	00	C6	0:8E	Fib	Status	
1B	01	01	0:61	Asyn(P)	PSUS			35005	00F0	2Q	00	A0	0:9E	Fib	Never	21(Grp)
1B	01	01	0:81	Asyn(S)	PSUE	SEQ	OFF	11111	0004	1B	0F	81	0:7E	Fib	Never	01(LU)
1B	01	01	0:A1	-----	Deleting											
1B	01	01	0:C1	Asyn(S)	Suspending			11111	0004	1B	0F	C1	0:3E	Fib	Never	01(Grp)
1B	01	01	0:E1	Asyn(S)	Suspending			11111	0004	1B	0F	E1	0:1E	Fib	Never	21(Grp)

Selected devices : 1

Snapshot... Display Filter... Change CU#... CU# : 0

Pair Operations

Pairedisplay... Pairesync...
Paircreate... Ldev Operation
Change Option...
Painsplit... Painsplit-S...

C/T Group Operation

This	Paired	Paired	#	CU	S/N	/	SSID	Path
06								
07	RCU	Used						Fib
08	MCU	12345 / 0a0f... S1						
09								
0A	MCU	Used						S1
0B	RCU	05500 / 1200... Fib						
0C								
0D	MSR	Used						Fib

Group Status... Add Group... Delete Group... Group Option...

Other Operations

Port... Async Option... Usage... Script... Exit

To open the HP Continuous Access main control window:

1. Start up and log in to Remote Control. You need administrator access or CA privileges to perform CA operations.
2. Connect to the desired disk array using the Connection Control window.

3. When the Option Select window opens, click **HP Continuous Access** to open the HP Continuous Access main control window.
4. The HP Continuous Access main control window (described below) displays the CA pair information for the most recently selected CU image of the connected disk array (lowest CU image with configured devices is the default) and allows you to perform CA operations.

The **CU S/N** field displays the serial number of the connected disk array.

The **RCU List** box displays RCUs which have been added to the current CU image and provides access to the RCU operations: add RCU, edit path/SSID, delete RCU, RCU options, and RCU status.

The **MCU List** box displays MCUs for P-VOLs in the current CU image.

The **Refresh** button refreshes the information displayed on the HP Continuous Access main control window.

The **History** button opens the History window, which shows the history of CA operations and allows you to save the information to a file on disk.

The **Volume List** box displays the volumes in the current CU image of the connected disk array and CA pair information for each volume. The buttons in the Volume List box provide access to the following functions:

- The (status) **Snapshot...** button allows you to write the CA pair status information to a text file. This creates a snapshot of the pair status.
- The **Display Filter...** button opens the Display Filter window, which allows you to control the volumes displayed by pair status, pair type, and group number.
- The **Change CU#...** button opens the Change CU# window, which allows you to select the CU image, which is displayed in the CU# field. The Volume List box displays only the volumes behind the selected CU image. CA operations apply only to those volumes.

The **Pair Operations** box provides access to the CA pair operations (see [Chapter 4](#)): pairdisplay, paircreate, change option, pairsplit-r (split pair), pairsplit-S (delete pair), and pairresync. The LDEV Operation button provides access to LDEV pair information, such as LUSE pairs.

The **C/T Group Operation** box displays the consistency group information for the connected disk array: group number, CU type of connected disk array (MCU and/or RCU), and serial number and SSID of other CU in the group. The buttons in the C/T Group Operation box provide access to the Async-CA control operations: group status, add group, delete group, and group options.

The **Other Operations** box provides access to the following operations:

- The **Port...** button opens the Port Change window, which allows you to configure the ports of the connected disk array.
- The **Async Option...** button opens the Async Option window, which allows you to select Async-CA options for the disk array.
- The **Usage...** button opens the Monitoring Parameter window, which allows you to view remote copy I/O statistics for the disk array.

The **Exit** button closes the main control window, exits the CA software, and returns you to the Remote Control Option Select window. Exiting the CA software does not affect the CA activities in progress.

Volume List box

The Volume List box on the HP Continuous Access main control window displays the following information for each volume (LU) of the disk array:

- **Port, ID, LUN:** Port number, SCSI target ID (TID), and LU number (LUN).
- **Vol:** CU image:LDEV ID. The CU images are numbered 0-F. The LDEV ID is hexadecimal (00-FF). For a LUSE volume, the first LDEV is listed.
- **Type:** Pair type: Sync or Async. (P) = CA primary volume; (S) = CA secondary volume. "-----" indicates a simplex or deleting volume. Volumes assigned to BC pairs are displayed as simplex volumes.
- **Status:**
 - **SMPL:** The volume is not currently assigned to a CA pair. When the initial copy is started by a paircreate operation, the volume status changes to COPY.

COPY: The CA initial copy operation is in progress. Data on the pair is not fully identical. When the initial copy is complete, the status will change to PAIR.

PAIR: The volume is currently assigned to a CA pair, and the pair is 100% synchronized. All updates from the host to the P-VOL are duplicated at the S-VOL.

PSUE: The pair has been suspended by the MCU or RCU due to an error condition. The volumes in this pair are not synchronized.

PSUS: The pair has been split by the user (pairsplit-R), or the pair has been deleted by the user from the RCU (pairsplit-S). The volumes in this pair are not synchronized.

PDUB: This CA LUSE pair is in the COPY or PAIR status, but at least one LDEV pair within the CA LUSE pair is in the SMPL or PSUE status.

Suspending: Async-CA only. This pair is not synchronized. This pair is in transition from the PAIR or COPY status to the PSUS/PSUE status.

Deleting: Async-CA only. This pair is not synchronized. This pair is in transition from the PAIR, COPY, or PSUS/PSUE status to the SMPL status.

- **Sub:** This substatus is displayed only for split/suspended Async-CA pairs and only at the RCU:
 - **GRP:** Update consistency of the volume is the same as that of the consistency group.
 - **LU:** Update consistency of the volume is not the same as that of the consistency group.
 - **OFF:** The volume is suspended by MCU power-off.
- **S/N and SSID** of the other disk array (MCU or RCU) of the volume pair.
- **Port, ID, LUN:** Port number, TID, and LUN of the other volume of the volume pair.
- **Vol:** CU image:LDEV ID of the other volume of the volume pair. For a LUSE volume, the first LDEV (lowest LDEV ID) is listed.

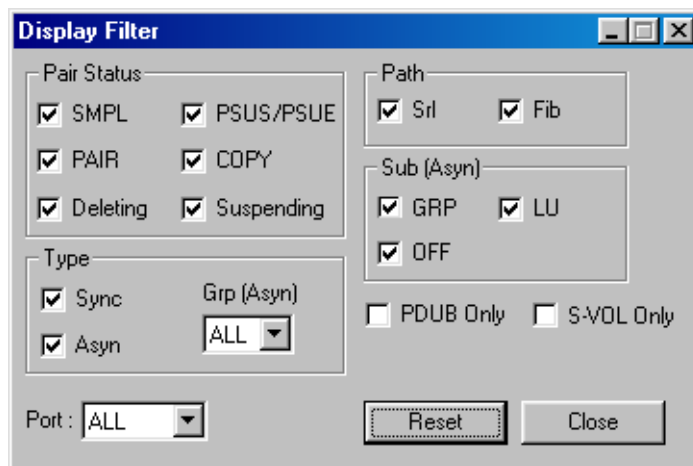
- **Path:** The channel path type: Fib (Fibre Channel) or Srl (serial). Fibre Channel and serial (ESCON) paths cannot coexist in the same CU image (pair).
- **Fence:** The P-VOL fence level of the CA volume pair: Data, Status, or Never.
- **Grp(Lv):** The Async-CA group number (0-3F hex) and async error-level option (group or LU) for this pair.

The Type, Sub, S/N, SSID, Fence, Path, and Grp(Lv) columns might become blank while the pair is in transition from a pair status to SMPL. To display the latest information in these columns, you must refresh the screen.

Display Filter window

The Display Filter window allows you to control which volumes are displayed in the main control window by pair status, pair type, group number (Async-CA only), port, path type (serial or Fibre Channel), consistency status (Async-CA only), and volume type (LUSE with PDUB status, S-VOL only). The Display Filter selections determine the pairs reported in the CA status snapshot file.

To open the Display Filter window, click the Display Filter... button in the main control window. Changes made in the Display Filter window are implemented in real-time (you do not need to close the window).



The **Pair Status** box allows you to display only volumes which have the selected pair status: SMPL, PAIR, PSUS/PSUE, COPY, Deleting (async only), and/or Suspending (async only). Simplex volumes are always displayed, except when PDUB Only or S-VOL Only is selected.

The **Type** box allows you to display only CA volumes of the selected type: Sync and/or Asyn. The Grp(Asyn) drop-down list box allows you to select the group(s) to be displayed.

The **Port** drop-down list box allows you to select the desired disk array port or all ports. The main control will display only the volumes behind the selected port(s).

The **Path** box allows you to display only CA volumes (pairs) with the selected path type: Srl (serial/ESCON) and/or Fib (Fibre Channel).

The **Sub(Asyn)** box allows you to display only volumes with the selected consistency status: GRP, LU, and/or OFF (displayed only at RCU for split and suspended Async-CA pairs).

The **PDUB Only** checkbox allows you to display only CA LUSE volumes with the PDUB status. When this box is selected, simplex volumes are not displayed.

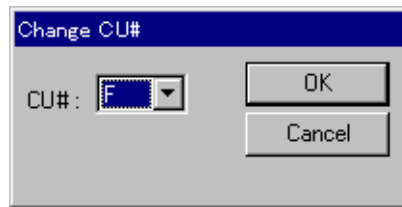
The **S-VOL Only** checkbox allows you to display only CA S-VOLs. When this box is selected, simplex volumes are not displayed.

The **Reset** button clears your selections and displays the default selections (select all in the Pair Status, Type, Path, and Sub(Asyn) boxes). The Close button closes the Display Filter window. You can use other windows without closing the Display Filter window.

Selecting the CU image

The Change CU# window allows you to select the CU image to be displayed in the HP Continuous Access main control window. When performing CA operations, you must select the appropriate CU image in order to access the desired volumes and MCU-RCU paths.

To open the Change CU# window, click **Change CU#...** in the main control window. The HP Continuous Access main control window displays only the LUs in the selected CU image.



The following configuration operations apply to all CU images of the connected disk array:

- Adding MCUs
- Configuring ports
- Setting RCU options (minimum paths, maximum initial copy activities, RIO MIH time, and path blockade watch time).

Configuring the MCU and RCU ports

CA allows you to change the configuration of the disk array ports as needed to accommodate the desired mainframe host and CA communications paths. CA ESCON and Fibre Channel ports must be configured as follows to allow CA communications:

- **ESCON** serial ports used in the **MCU** for communications **to RCUs** must be configured as remote control ports, **RCP**.
- **ESCON** serial ports used in the **RCU** for communications with MCUs must be configured as local control ports, **LCP**.
- **Fibre Channel** ports used at the **MCU** for CA communications to the RCUs must be configured as **initiator ports**.
- **Fibre Channel** interface ports in the **RCU** used to communicate with the MCU must be configured as **RCU target ports**.

The Port Change window displays the ESCON and/or fibre ports of the connected disk array and allows you to change the mode (local, remote, initiator, target, or RCU target) of each port. You cannot select both ESCON and Fibre Channel ports at the same time.

To open the Port Change window, click **Port...** in the HP Continuous Access main control window. [Table 5](#) lists the port types.

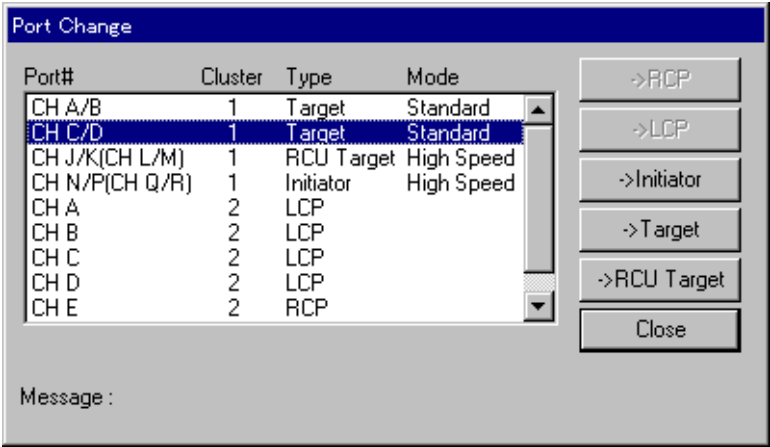


Table 5. Port mode information

Current Mode	Description
CH A 1 Target Standard	The port for channel A in cluster 1 is configured as a target with Standard Fibre PCB mode. (2-port CHF package)
CH A/B 1 Target Standard	The port for channels A and B in cluster 1 is configured as a target with Standard Fibre PCB mode. (4-port CHF package)
CH J/K (CH L/M) 1 RCU Target High Speed	The port for channels J, K, L, and M in cluster 1 is configured as an RCU target with High Speed Fibre PCB mode. (4-port CHF package)
CH N (CH Q) 1 Initiator High Speed	The port for channels N or Q in cluster 1 is configured as an initiator with High Speed Fibre PCB mode. (2-port CHF package)
CH E 2 RCP	The port for channel E in cluster 2 is configured as an RCP.

Before changing the operation mode of an ESCON port from LCP to RCP, remove all MF channel paths to the specified port using MF host system console or ESCD commands.

To change LCP to RCP:

1. Start Remote Control, connect to the desired disk array, and start the CA software.
2. In the HP Continuous Access main control window, click **Port...** to open the Port Change window.
3. In the Port Change window, select the LCP(s) you want to reconfigure, and then click **RCP**. Note: Make sure that the port being reconfigured is disconnected from the MF host.
4. The Remote Console PC displays a message asking you to take (set) the selected channel paths offline. Make sure that the selected paths are offline from the host(s), and then click OK.

5. The Message area displays the status of the port change operation. The disk array makes sure that the channels are offline, and then blocks the channels and reconfigures the port.
6. When the port change operation is complete, the remote console PC displays a message asking you to exchange the channel cable connections. Make sure that the channel cable connections have been exchanged, and then click **OK**.
7. The Message area now displays the status of the port recovery operation. When the port recovery operation is complete, you may close the Port Change window or reconfigure additional ports as needed.

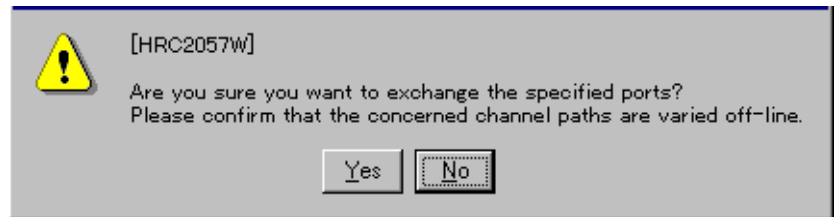
Before changing the operation mode of a port from RCP to LCP, delete all affected CA pairs, delete all paths to the RCU from that RCP, and then delete the RCU from the MCU.

To change RCP to LCP:

1. Start Remote Control, connect to the desired disk array, and start the CA software.
2. In the HP Continuous Access main control window, click **Port...** to open the Port Change window.
3. In the Port Change window, select the RCP(s) you want to reconfigure, and select LCP.
4. The remote console PC displays a message asking you to take the selected channel paths offline. Make sure that the selected paths are offline from the host(s), and then click **OK**.
5. The Message area displays the status of the port change operation. The disk array makes sure that the channels are offline, and then blocks the channels and reconfigures the port.
6. When the port change operation is complete, the remote console PC displays a message asking you to exchange the channel cable connections. Make sure that the channel cable connections have been exchanged, and then click **OK**.
7. The Message area now displays the status of the port recovery operation. When the port recovery operation is complete, you may close the Port Change window or reconfigure additional ports as needed.

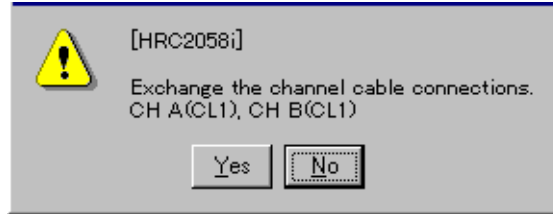
To change Target/RCU Target to Initiator:

1. Make sure that the port(s) to be reconfigured is/are disconnected from the host.
2. Start Remote Control, connect to the desired disk array, and start the CA software.
3. Delete all affected CA pairs. If the port is configured as an RCU target, also delete all paths from the MCU(s).
4. Exit the CA software, and then start the LUN Manager software.
5. Remove all channel paths to the port(s) to be reconfigured, and exit LUN Manager.
6. Restart the CA software, and then click **Port...** in the HP Continuous Access main control window to open the Port Change window.
7. In the Port Change window, select the target(s) or RCU target(s) you want to reconfigure, and click **Initiator**. Make sure that the port being reconfigured is disconnected from the host, that no logical path is defined for the port, and that no path is defined between the port and MCU initiator port(s).
8. The remote console PC displays a message asking you to verify that you want to exchange the ports. Make sure that the selected paths are offline from the host(s), and then click **Yes**. If you want to cancel the operation, click **No**.



9. The Message area displays the status of the port change operation. The disk array makes sure that the channels are offline, and then blocks the channels and reconfigures the port.

10. When the port change operation is complete, the remote console PC displays a message asking you to exchange the channel cable connections. Make sure that the channel cable connections have been exchanged, and then click **Yes**. To cancel the operation, click **No**.



11. The Message area now displays the status of the port recovery operation. When the port recovery operation is complete, you may close the Port Change window or reconfigure additional ports as needed.

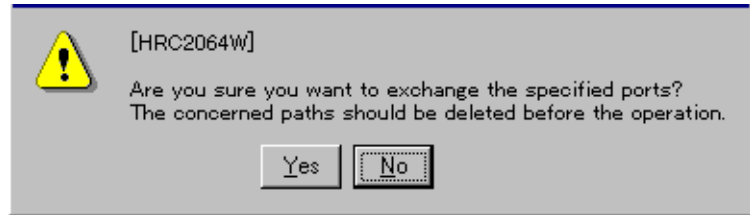
Before changing the operation mode of a Fibre Channel port from Initiator to Target or RCU Target, delete all affected CA pairs, delete all paths to the RCU from the initiator port, and then delete the RCU from the MCU.

To change Initiator to Target/RCU Target:

1. Start Remote Control, connect to the desired disk array, and start the CA software.
2. Delete all affected CA pairs, and then delete all paths to the RCU(s).
3. In the HP Continuous Access main control window, click **Port...** to open the Port Change window.
4. In the Port Change window, select the initiator(s) you want to reconfigure, and click **Target** or **RCU Target**.

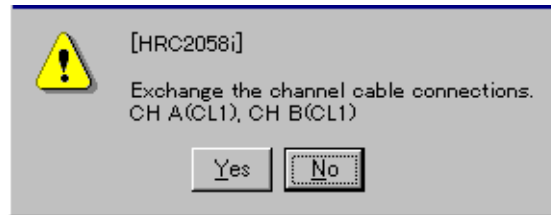
Make sure that no path is defined between the initiator port and the RCU target port(s).

5. The remote console PC displays a message asking you to delete affected paths. Make sure that all affected paths are deleted, and then click **Yes**. If you want to cancel the operation, click **No**.



The Message area displays the status of the port change operation. The disk array makes sure that the channels are offline, and then blocks the channels and reconfigures the port.

6. When the port change operation is complete, the remote console PC displays a message asking you to exchange the channel cable connections. Make sure that the channel cable connections have been exchanged, and then click **Yes**.



7. The Message area now displays the status of the port recovery operation. When the port recovery operation is complete, you may close the Port Change window or reconfigure additional ports as needed.

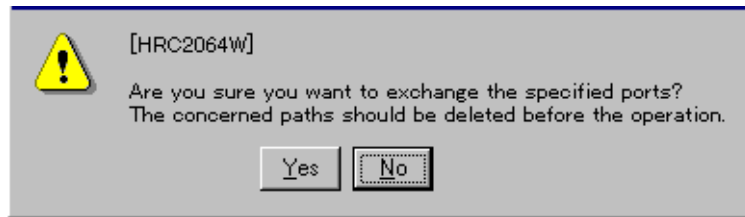
Please limit the number of hosts connected to an RCU target port to 128 or fewer to avoid mistaken disconnection. If more than 128 hosts are connected to an ordinary target, some hosts may be disconnected after changing the mode from Target to RCU Target.

To change Target to RCU Target:

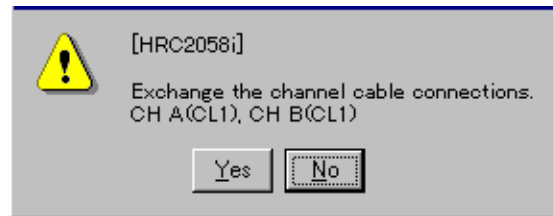
1. Start Remote Control, connect to the desired disk array, and start the CA software.
2. In the HP Continuous Access main control window, click **Port...** to open the Port Change window.
3. In the Port Change window, select the target port(s) you want to reconfigure, and select **RCU Target**.

Make sure that the affected paths of the target port being reconfigured are deleted.

4. The remote console PC displays a message asking you to delete affected paths. Make sure that all affected paths are deleted, and then click **Yes**. If you want to cancel the operation, click **No**.



5. The Message area displays the status of the port change operation. The disk array makes sure that the channels are offline, and then blocks the channels and reconfigures the port.
6. When the port change operation is complete, the remote console PC displays a message asking you to exchange the channel cable connections. Make sure that the channel cable connections have been exchanged, and then click **OK**.



7. The Message area now displays the status of the port recovery operation. When the port recovery operation is complete, you may close the Port Change window or reconfigure additional ports as needed.

MCU operations

The MCUs are the disk control units which control the P-VOLs of the CA volume pairs. Each disk array attached to the remote console PC on the disk array-internal LAN can function as an MCU. The MCUs receive and process user-requested CA commands from the remote console PC, and send the remote copy operations to the RCUs. The MCUs can also function as RCUs, provided the remote copy connections are properly configured.

Adding MCUs

Adding disk array MCUs is done using Remote Control on the remote console PC, not CA. For instructions on adding disk arrays, refer to the Remote Control documentation.

RCU operations

The RCUs are the control units that control the S-VOLs of the volume pairs. The RCUs are connected to the MCUs via the remote copy connections and receive and process commands from the MCUs. For CA operations, the secondary remote console PC at the remote site should be connected to the RCUs to allow CA commands to be issued directly to the RCU (for example, in case of disaster or failure at the primary site).

RCU operations are performed separately for each CU image of each MCU and RCU to provide maximum flexibility. The RCU operations are:

- Adding RCUs
- Setting the RCU options (Note: The RCU options apply to all CU images of the MCU)
- Determining the RCU path parameters
- Adding and deleting logical paths to an RCU
- Adding and deleting SSIDs for an RCU
- Viewing RCU status
- Deleting RCUs

Adding an RCU

The remote copy connections and ports must be properly installed and configured before you can add an RCU.

When you add an RCU, the current CU image registers the specified RCU and establishes the specified number of logical paths from the RCU to the MCU. You can add up to four RCUs, four logical paths, and eight physical paths to a CU image.

The logical paths are established for the CU images of the MCU and RCU separately. After you have added an RCU (and path status is normal), you can create CA pairs which have S-VOLs in the newly added RCU.

To add an RCU to the connected MCU:

1. Make sure the remote copy connections and MCU ports are properly configured. Get the S/N of the RCU and the SSID(s) for the desired CU image in the RCU. The add RCU operation will fail without this information. The disk array should have a label or tag indicating its S/N and SSIDs. The HP representative can also get the RCU S/N and SSIDs using the RCU's SVP (that is, at the remote site).

Caution

If you are connecting the XP512 and XP256 disk arrays in a mixed configuration, make sure that each disk array has a unique serial number. If you have two disk arrays with the same serial number, contact HP.

2. In the HP Continuous Access main control window, make sure the correct CU image is selected. Click **Change CU#** to change CUs. You must add RCUs to each CU image separately.
3. In the HP Continuous Access main control window, click **Add RCU...** to open the Add RCU window.

The Add RCU window allows you to add an RCU to the current CU image of the connected MCU.

The screenshot shows a Windows-style dialog box titled "Add RCU". It contains the following fields and controls:

- RCU S/N :** A text box containing "32768".
- SSID1 :** A text box containing "0A".
- SSID2 :** An empty text box.
- SSID3 :** An empty text box.
- SSID4 :** An empty text box.
- Num. of Path :** A dropdown menu showing "1".
- Port Type:** A group box containing two radio buttons: "Serial" (unselected) and "Fibre" (selected).
- Controller ID :** A text box containing "02".
- Buttons:** "OK" and "Cancel" buttons are located on the right side of the dialog.

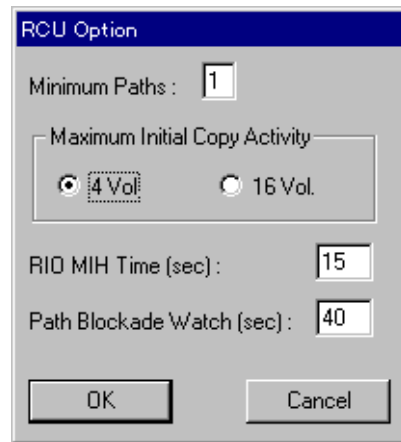
4. In the Add RCU window, enter the S/N of the RCU and the SSID(s) for the desired CU image. The MCU verifies the S/N when the paths are established, and verifies the SSIDs when the volume pairs are created. If desired, you can add and delete SSIDs later using the Edit SSID window.
5. Select the number of paths to be established to the RCU in the Num. of Path list box (1 through 8). The MCU will not allow you to establish less than the minimum number of paths as specified in the RCU Option window. If desired, you can add and delete paths later using the Edit Path window.
6. Select the port type using the **Serial (ESCON)** or **Fibre** button in the Port Type box. If you select the **Fibre** button, specify the controller ID (02) in the Controller ID entry box.
7. After entering the S/N, SSID(s), number of paths, port type, and controller ID (fibre only), click **OK** to open the RCU Option window.
8. In the RCU Option window, enter or select the desired settings for Minimum Paths, Maximum Initial Copy Activity, RIO MIH Time, and Path Blockade Watch setting. For multiplatform disk array configurations with both CA and BC paths, set the Maximum Initial Copy Activity to 4 Vol (Fibre Channel only). Make sure to click **OK** in the RCU Option window (even if you made no changes). The Path Parameter window now opens. For multiplatform disk array configurations, set the Maximum Initial Copy Activity to 4 Vol.

See the description of [“Setting RCU options” on page 84](#) for details about the RCU Option window.
9. In the Path Parameter window, enter the parameters for the first path, and then click OK. Parameters include Port, Link Adr., and Logical Adr. for ESCON; MCU Port, RCU Port, and Logical Adr. for Fibre Channel. If you selected more than one path in step (5), the Path Parameter window will reset to allow you to enter the information for the next path. When you have entered the parameters for all paths, click **OK**. (See [“Setting RCU path parameters” on page 86](#) for details about this window.)

10. The new RCU is displayed in the RCU List box on the HP Continuous Access main control window. To check the path status for this RCU, select the RCU, and then select **RCU Status....** (See [“Viewing RCU status” on page 98](#) for details about the RCU Status window.)

Setting RCU options

The RCU Option window allows you to set certain RCU operational limits for the connected disk array. These RCU options apply to all CU images of the current MCU and to all RCUs connected to the MCU. The RCU Option window opens automatically when you add an RCU, and can also be accessed using the **RCU Option...** button on the HP Continuous Access main control window.



The Minimum Paths, Maximum Initial Copy Activity, RIO MIH Time, and Path Blockade Watch settings are common to both CA and BC. The most recently entered values (entered in either the CA or BC RCU Option window) are applied to both CA and BC operations. The Minimum Paths option allows you to specify the minimum number of paths required for each RCU connected to the current MCU. If the number of paths falls below this number because of a failed path, the MCU suspends affected CA pairs to prevent remote copy operations from adversely affecting performance.

If the MCU contains CA pairs, which contain critical data for disaster recovery, set the minimum number of paths to one, so that CA operations continue even if there is only one path to an RCU. If you need high performance at the MCU, set the minimum number of paths to two or more (up to eight per CU image), depending on the number of pairs managed by the MCU.

Caution *If CA volume pairs are suspended because the number of paths has dropped below this setting, the P-VOL fence-level pair option determines whether the Sync-CA P-VOLs are fenced (that is, reject all write operations).*

The Maximum Initial Copy Activity setting specifies the number of concurrent initial copy operations: 4 Vol or 16 Vol. CA initial copy activities can impact the performance of the main disk array, depending on the amount of I/O activity and the number of pairs being added at the same time. The maximum initial copy activity setting of 4 Vol allows you to limit the impact of initial copy activities on disk array performance. For example, if you set the maximum initial copy activity to 4 Vol and then add five CA pairs at the same time, the MCU starts the first four pairs and will not start the fifth pair until one of the first four pairs is synchronized (PAIR status). When you change the maximum initial copy activity setting, the new setting applies to pairs created after the setting was changed, not to existing pairs.

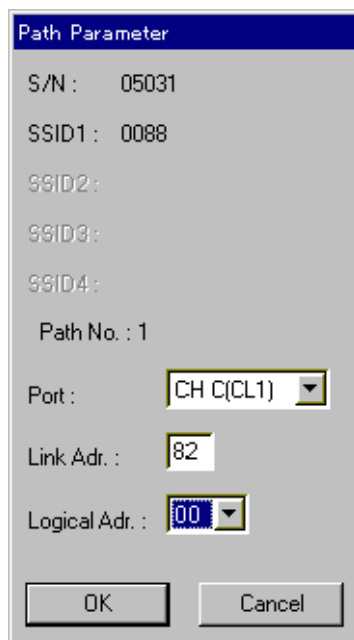
The RCU options are common to both CA and BC operations. For multiplatform disk array configurations with both CA and BC paths, the Maximum Initial Copy Activity must be set to 4 Vol. CA and BC RCU Option window selections apply to both CA and BC operations.

The RIO MIH Time setting specifies the time value for the remote I/O (RIO) missing interrupt handler (MIH), which is the wait time until data transfer from the MCU to RCU is complete. The RIO MIH time value must be from 10 to 100 seconds. The default setting is 15 seconds. This setting is available for both ESCON and Fibre Channel interfaces.

The Path Blockade Watch setting specifies the time for monitoring blockade in the Fibre Channel paths on the MCU side. The path blockade watch value must be from 0 to 45 seconds. The default setting is 40 seconds. This setting is available for Fibre Channel interface only.

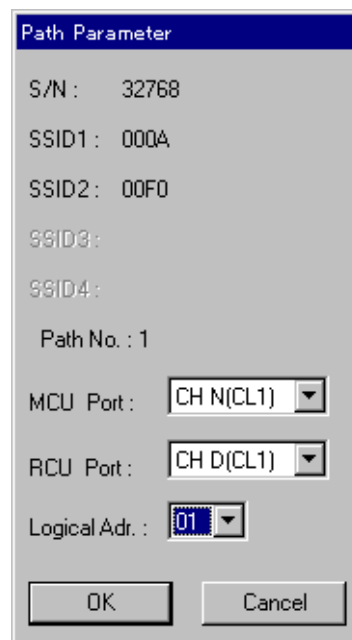
Setting RCU path parameters

The Path Parameter window allows you to enter the parameters for a new logical path from the connected MCU to the specified RCU. The Path Parameter window opens automatically when you add an RCU or add a path to an existing RCU. (The ESCON version of the window appears on the left and FC on the right below).



The Path Parameter window for ESCON configuration displays the following fields and controls:

- S/N :** 05031
- SSID1 :** 0088
- SSID2 :**
- SSID3 :**
- SSID4 :**
- Path No. :** 1
- Port :** CH C(CL1) (dropdown menu)
- Link Adr. :** 82
- Logical Adr. :** 00 (dropdown menu)
- Buttons:** OK, Cancel



The Path Parameter window for FC configuration displays the following fields and controls:

- S/N :** 32768
- SSID1 :** 000A
- SSID2 :** 00F0
- SSID3 :**
- SSID4 :**
- Path No. :** 1
- MCU Port :** CH N(CL1) (dropdown menu)
- RCU Port :** CH D(CL1) (dropdown menu)
- Logical Adr. :** 01 (dropdown menu)
- Buttons:** OK, Cancel

The Path Parameter window displays the S/N and SSID(s) of the RCU to which the path is being established and allows you to enter the parameters for the new path. The **OK** button notifies the MCU to establish the specified path.

The RCU path parameters for ESCON are:

- **Port:** The Port drop-down list box displays the remote control ports (RCPs) of the connected disk array. Only the ports which are already configured as RCPs are displayed.
- **Link Adr:** The Link Adr. field allows you to enter the link destination address for the new path. If the remote copy connection to the RCU is

a dynamic link, the link address is the destination port address on the **ESCD**. If the remote copy connection to the RCU is a static link, the link address is 00.

- **Logical Adr:** The Logical Adr. drop-down list box allows you to select the logical CU address (CU image number) of the RCU: 00-0F.

The RCU path parameters for Fibre Channel interface are:

- **MCU Port:** The MCU Port drop-down list box displays the initiator ports of the connected disk array. Only ports which are already configured as initiator ports are displayed.
- **RCU Port:** The RCU Port drop-down list box displays the RCU target ports for the new path. You can select a port from CH a to CH r.
- **Logical Adr:** The Logical Adr. drop-down list box allows you to select the logical CU address (CU image number) of the RCU: 00-1F.

Path parameter examples

The RCU path parameters are similar to the channel path definitions in the I/O configuration dataset (IOCDS). In the IOCDS, a logical path is specified with a subchannel number, link destination address, and logical address for the CU. CA uses the "port" parameter instead of the subchannel number to specify the MCU's ESCON port. For the XP512 disk array, the logical address must correspond to the CU image number. [Figure 19](#) shows a typical CA remote copy configuration with two paths. [Figure 20](#) shows a configuration with ESCON connections going through two ESCON storage directors and the CA remote console windows used for this configuration.

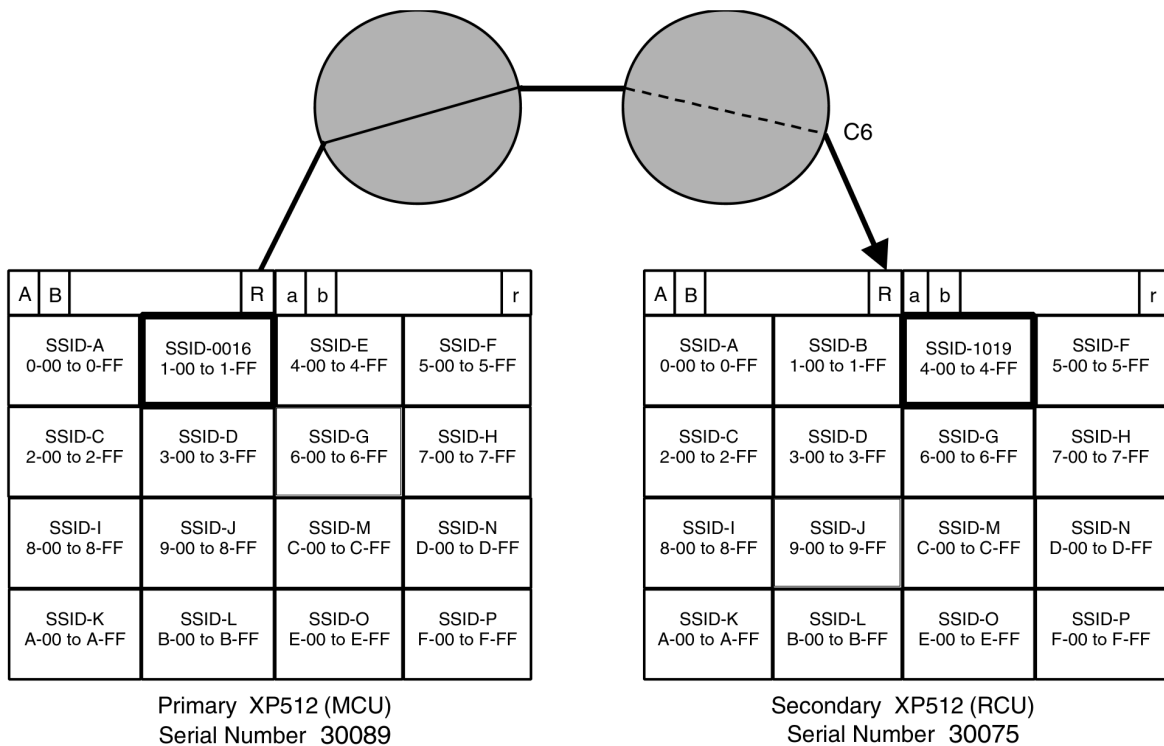
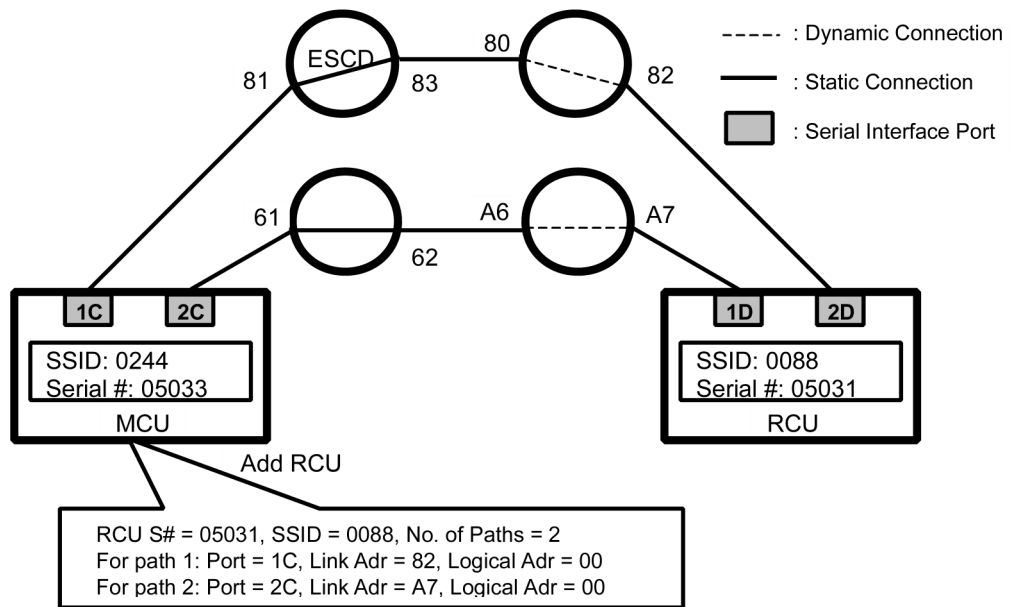


Figure 19. Add RCU operation, example 1



Add RCU

RCU S/N : 05031

SSID1 : 0088

SSID2 :

SSID3 :

SSID4 :

Num. of Path : 2

Path Parameter

S/N : 05031

SSID1 : 0088

SSID2 :

SSID3 :

SSID4 :

Path No. : 1

Port : CH C(CL2)

Link Adr. : A7

Logical Adr. : 00

Path Parameter

S/N : 05031

SSID1 : 0088

SSID2 :

SSID3 :

SSID4 :

Path No. : 1

Port : CH C(CL1)

Link Adr. : 82

Logical Adr. : 00

Figure 20. Add RCU operation, example 2, ESCON (serial)

For Fibre Channel interface, two types of CHF P/K (Fibre Channel packages) are provided: 4-port and 2-port packages. The port mode depends on the package type. Also, each port may have a different PCB mode setting (Standard or High Speed). Therefore, when you configure paths among the initiator ports, target ports, and RCU target ports, study the port modes and specify the correct mode for each port. For details on the relationship between ports and PCB modes and instructions for setting the PCB mode, please refer to the LUN Manager documentation. [Figure 21](#) shows Fibre Channel interface connections going through switches and the CA remote console windows used for this configuration.

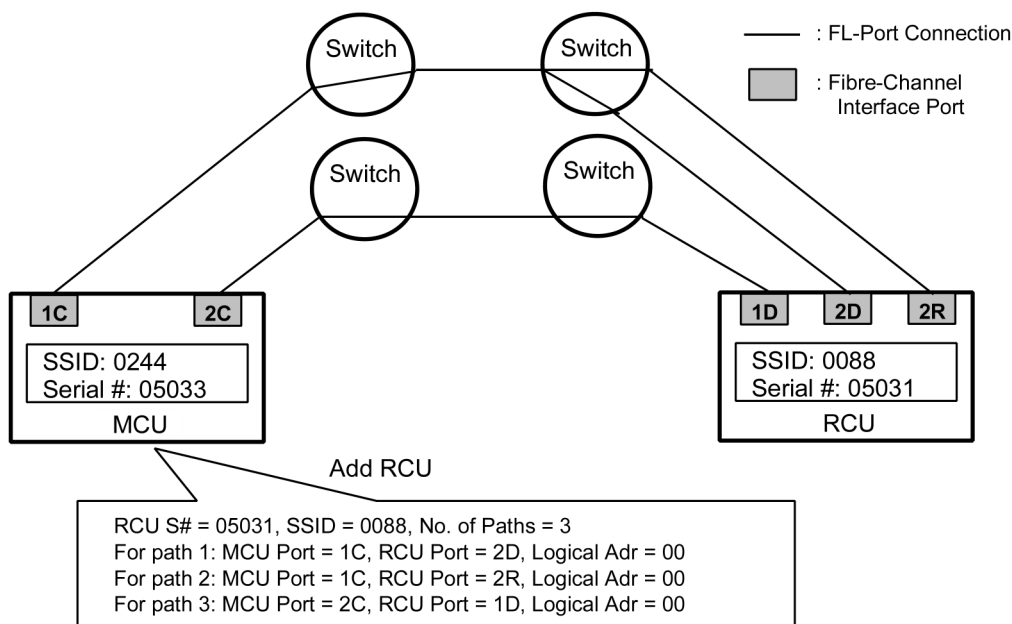


Figure 21. Add RCU operation, example 2, Fibre Channel Interface

[Figure 22](#) shows the settings and parameters corresponding to the configuration presented in Example 2 above.

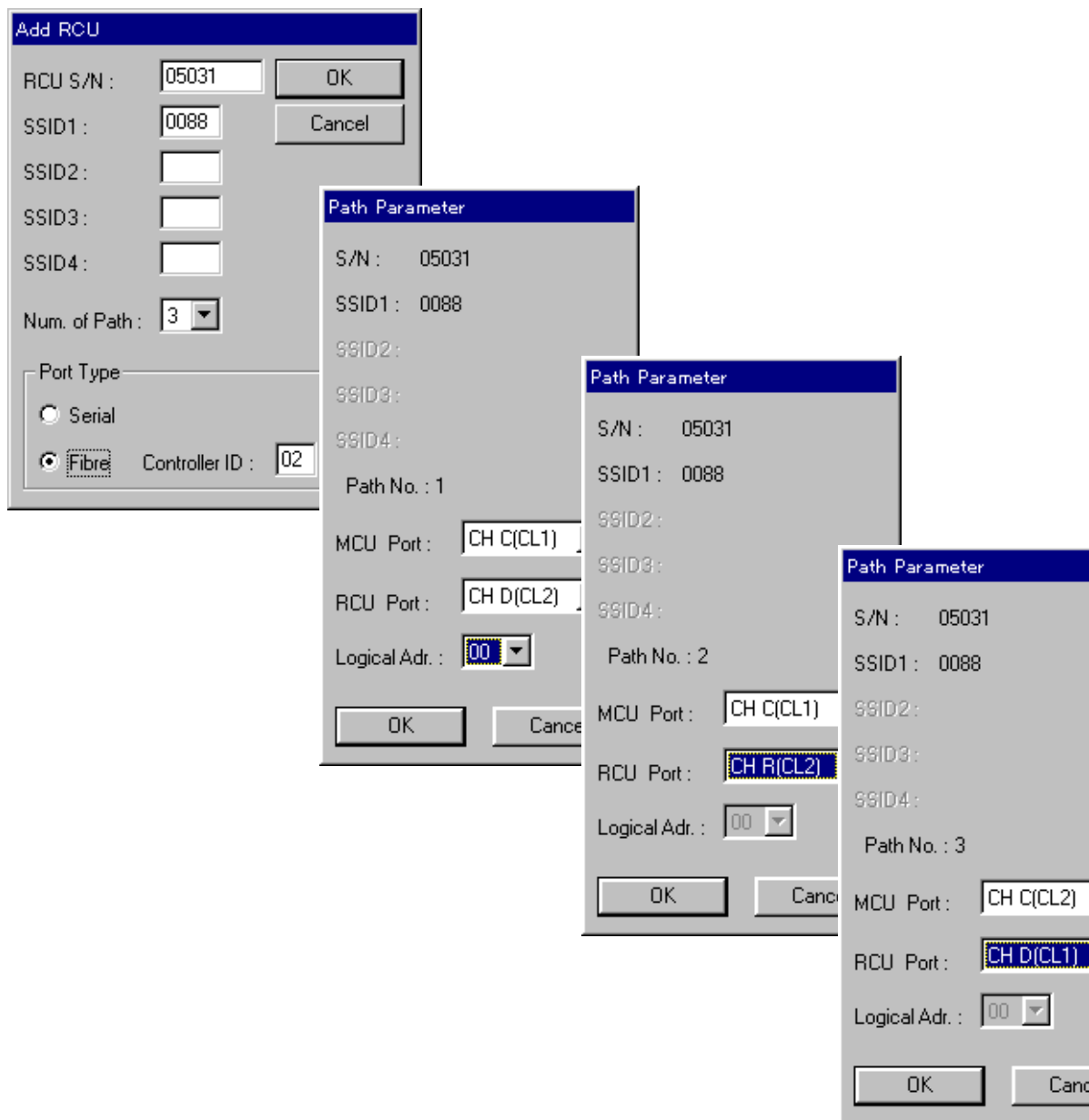


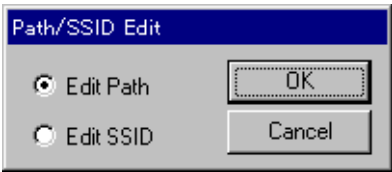
Figure 22. Add RCU operation, example 2, Fibre Channel Interface settings

Adding and deleting logical paths for an RCU

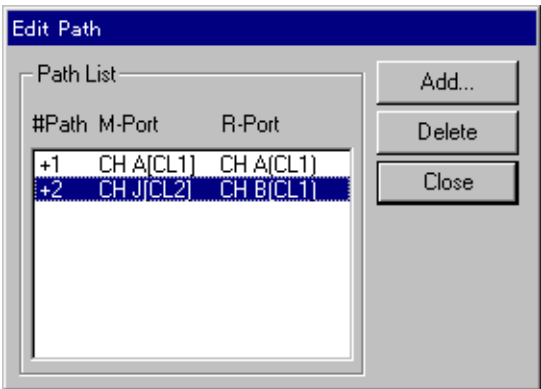
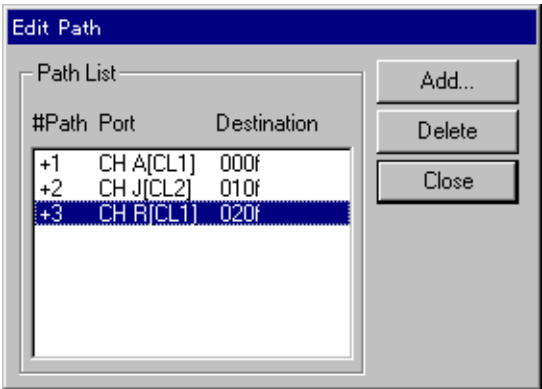
The Path/SSID Edit window provides access to the Edit Path window and Edit SSID window.

To add or delete logical paths from an MCU to an existing RCU:

1. Select the appropriate MCU CU image in the HP Continuous Access main control window.
2. Select the desired RCU in the RCU list box.
3. Click **Edit Path/SSID** to open the Edit Path/SSID window.



4. Click **Edit Path** to choose the Edit Path window.
5. Click **OK** to open the Edit Path window (ESCON or Fibre).



The Edit Path window allows you to add and delete logical paths from the MCU for the selected RCU. The Path List box lists the existing paths between the MCU and the selected RCU by path number, displays the port, cluster, and link address for each path, and indicates the status of each path (+ normal, - not normal).

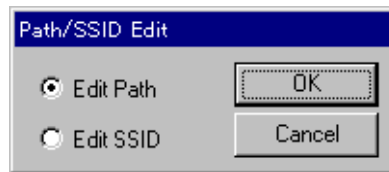
The **Add...** button opens the Path Parameter window, which allows you to enter the path parameters.

The **Delete** button allows you to delete the selected path(s).

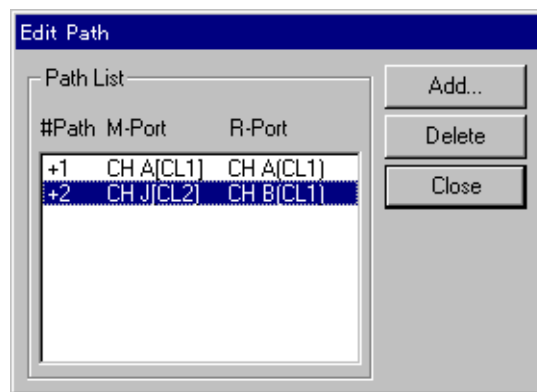
Before adding a path to an RCU, make sure that the remote copy connection is installed, the ports are configured (as MCU RCP/initiator ports and as RCU LCP/target ports), and the appropriate MCU CU image is selected. You can add up to four RCUs to each MCU CU image and establish up to eight paths to each RCU. When you add a path to an RCU, CA will automatically start using the new path to perform CA copy activities.

To add a new logical path from the MCU to an existing RCU:

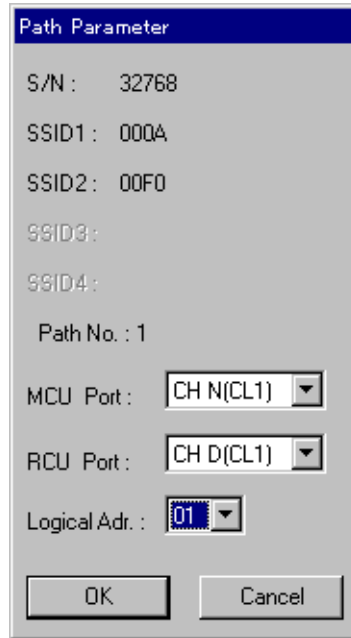
1. In the HP Continuous Access main control window, select the appropriate CU image, select the desired RCU in the RCU List box, and then click **Edit Path/SSID** to open the Path/SSID Edit window.



2. In the Path/SSID Edit window, click **Edit Path** and click **OK** to open the Edit Path window.
3. In the Edit Path window, click **Add...**



The Path Parameter window opens.

The image shows a 'Path Parameter' dialog box with a blue title bar. It contains several fields: 'S/N' with the value '32768', 'SSID1' with '000A', 'SSID2' with '00F0', 'SSID3' and 'SSID4' which are empty. Below these is 'Path No.' with the value '1'. Then there are three dropdown menus: 'MCU Port' set to 'CH N(CL1)', 'RCU Port' set to 'CH D(CL1)', and 'Logical Adr.' set to '01'. At the bottom are 'OK' and 'Cancel' buttons.

Path Parameter

S/N : 32768

SSID1 : 000A

SSID2 : 00F0

SSID3 :

SSID4 :

Path No. : 1

MCU Port : CH N(CL1)

RCU Port : CH D(CL1)

Logical Adr. : 01

OK Cancel

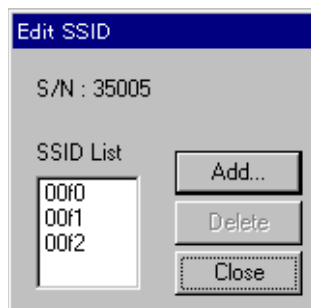
4. In the Path Parameter window, enter the parameters for the new path, and click **OK**. The Edit Path window displays the new path information. Verify that the new path appears in the Path List box, and then close the Edit Path window. The MCU will automatically begin using the new logical path for CA activities.
5. Before deleting a path to an RCU, make sure that the remaining number of paths will be equal to or greater than the minimum number of paths setting (selected in the RCU Option window). The delete path operation will fail if the number of remaining paths is less than the minimum number of paths.

To delete a path from the MCU to an existing RCU:

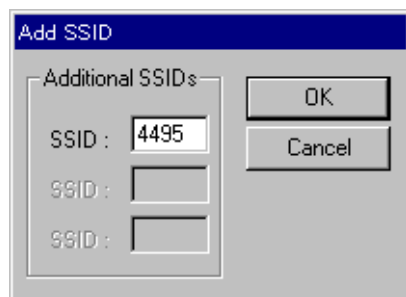
1. Open the RCU Option window, and check the minimum number of paths setting. If the remaining number of paths will be less than this value, the delete path operation will fail. If needed, change the minimum number of paths so that you can delete the desired path.
2. On the CA main control window, select the appropriate CU image, select the desired RCU in the RCU List box, and then click **Edit Path/SSID...** to open the Path/SSID Edit window.
3. In the Path/SSID Edit window, click **Edit Path**, then click **OK** to open the Edit Path window.
4. In the Edit Path window, select the path to be deleted, and then click **Delete**. The Edit Path window updates itself to reflect the new path information.
5. Verify that the specified path has been removed from the Path List box, and then close the Edit Path window.

Adding and deleting SSIDs for an RCU

The Edit SSID window allows you to add and delete SSIDs for an existing RCU. To open the Edit SSID window, select the appropriate MCU CU image on the main control window, select the desired RCU in the RCU List box, and click **Edit Path/SSID** to open the Path/SSID Edit window. Then click **Edit SSID**, and click **OK**.



The Edit SSID window displays the S/N and current SSID(s) for the selected RCU. The **Add...** button opens the Add SSID window, which allows you to add up to three SSIDs to the selected RCU CU image. The **Delete** button allows you to delete selected SSID(s).



Before adding an SSID, make sure that the remote copy connection is properly installed. You can add up to three SSIDs to each RCU. Before deleting an SSID, make sure the remaining SSIDs are still valid, or the connection between the MCU and RCU may be lost.

To add an SSID for an existing RCU:

1. In the HP Continuous Access main control window, select the appropriate CU image, select the RCU whose SSIDs you want to change, and then click the **Edit Path/SSID...** button to open the Path/SSID Edit window.
2. In the Path/SSID Edit window, click **Edit SSID**, and then click **OK** to open the Edit SSID window.
3. In the Edit SSID window, click the **Add...** button to open the Add SSID window.
4. In the Add SSID window, enter the new SSID(s) in the SSID fields, and then click **OK**.
5. After the disk array's SSIDs are reconfigured, the SSID List in the Edit SSID window will reflect the additional SSID(s). When you are finished adding SSIDs, close the Edit SSID window.

To delete an SSID for an existing RCU:

1. In the Edit SSID window, select the SSID you want to delete, and click **Delete**.
2. When the confirmation window appears, click **Yes** to delete the selected SSID.
3. After the disk array's SSIDs are reconfigured, the SSID List on the Edit SSID window will reflect the SSID deletion. Repeat step (a) for each SSID you wish to delete.
4. When you are finished deleting SSIDs, close the Edit SSID window.

Viewing RCU status

The RCU Status window displays the RCU options and the status of each logical path from the MCU to the selected RCU. [Table 6](#) explains the RCU path status descriptions. To open the RCU Status window, select the desired CU image on the HP Continuous Access main control window, select the desired RCU, and then click **RCU Status...** (The ESCON version of the RCU Status window appears on the left and FC on the right below.)

RCU Status

RCU S/N : 35005

SSID : 00f0, 00f1, 00f2

Path Type : Serial

Minimum Paths : 1

Maximum Initial Copy Activity (Vol.) : 8

Last Time : 12/31/2000 22:05:08

Reg. Time : 06/07/1996 09:37:36

RIO MIH Time (sec) : 25

Path Blockade Watch (sec) :

#Path	Port	Destination
+1	CH A[CL1]	000f
+2	CH J[CL2]	010f
+3	CH R[CL1]	020f

+ : Normal Status, - : Not Normal Status

Path Status : Normal

Close

Refresh

RCU Status

RCU S/N : 32768

SSID : 000a, 00ab

Path Type : Fibre

Minimum Paths : 2

Maximum Initial Copy Activity (Vol.) : 1

Last Time : 12/31/2000 22:05:08

Reg. Time : 06/07/1996 09:37:36

RIO MIH Time (sec) : 50

Path Blockade Watch (sec) : 18

#Path	M-Port	R-Port
+1	CH A[CL1]	CH A[CL1]
+2	CH J[CL2]	CH B[CL1]

+ : Normal Status, - : Not Normal Status

Path Status : Normal

Close

Refresh

The RCU Status window displays the following information for the selected RCU:

- **S/N and SSID(s)** of the selected RCU.
- **Path Type:** Serial or Fibre
- **Minimum Paths:** number of minimum paths
- **Maximum Initial Copy Activity (Vol.):** maximum copy activity by number of volumes
- **Last Time:** date and time of the last RCU path status update.
- **Reg. Time:** date and time RCU was added to the MCU (registered).
- **RIO MIH Time [sec]:** Timer for RIO MIH (wait time until data transfer from the MCU to RCU is complete). This setting is available for both ESCON and Fibre Channel interfaces.
- **Path Blockade Watch [sec]:** Time for monitoring blockade in the Fibre Channel paths on the MCU side. This setting is available for Fibre Channel interface only.
- **#Path:** The paths are listed by path number, port or MCU port, cluster, and destination link address or RCU port. A plus sign (+) indicates normal status, and a minus sign (-) indicates not normal status. To display the detailed path status, select the path.
- **Path Status:** See the table below for status descriptions

Table 6. Logical path status

Status Description	Condition
Normal	This logical path has been successfully established and can be used for CA copy activities.
Initialization Failed	The link initialization procedure with the RCU has failed because either the physical path connection between the MCU and the RCU or the connection between the MCU and the host was missing.
Communication Timeout	A timeout error has occurred between the MCU and RCU.
Resource Shortage	The establish logical path link function has been rejected by the RCU. All logical path resources in the RCU might be used for other connections.

Serial Number Mismatch	The serial number of the control unit which is connected to this logical path does not match the serial number specified by the RCU S# parameter.
Invalid Port	The ESCON port specified by the Port parameter is not in the RCP or initiator mode.
RCU Port Number Mismatch	The specified port in the RCU is physically disconnected from the MCU, or the port is not configured as an RCU target port.

Deleting an RCU

You can delete an RCU from an MCU only after all CA volume pairs between the MCU CU image and RCU CU image have been deleted. When you delete an RCU from an MCU, the MCU deletes all logical paths from the current MCU CU image to the selected RCU CU image. Deleting an RCU does not affect the CA operations between the other MCU CU images and that RCU.

After an RCU has been deleted, you can reconfigure the remote copy connections to add another RCU to the MCU, or you can remove the remote copy connections and reconfigure the MCU ports (RCPs to LCPs for ESCON; initiator ports to ordinary target ports for fibre) to provide additional host channels for the MCU.

The **Delete RCU** button on the HP Continuous Access main control window allows you to delete the selected RCU from the current MCU CU image. If all affected pairs have not been deleted, the MCU will reject the delete RCU operation to prevent accidental deletion of CA pairs.

To delete an RCU from an MCU:

1. Start Remote Control, connect to the desired MCU, and start the CA software.
2. In the HP Continuous Access main control window, select the desired CU image using the **Change CU#** button.
3. Make sure all affected CA volume pairs have been deleted. The volume pairs that consist of a P-VOL in the connected MCU and CU image and an S-VOL in the selected RCU must be deleted.

4. In the HP Continuous Access main control window, select the RCU to be deleted in the RCU List box, and then click **Delete RCU**.
5. When the confirmation window appears, click **OK** to delete the selected RCU.

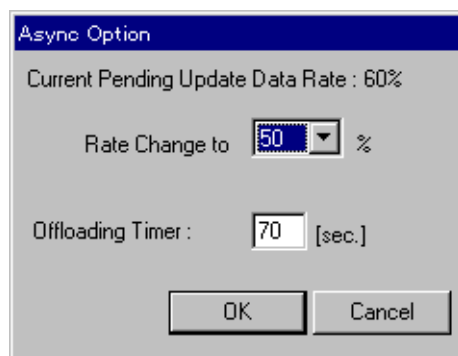
Async-CA control operations

The Async-CA control operations include:

- Configuring the CA async options
- Adding consistency groups
- Setting the consistency group options
- Viewing consistency group status
- Deleting consistency groups

Configuring Async-CA options

The Async Option window allows you to select the CA async options for the connected disk array. The async options apply to the entire physical control unit, including all CA P-VOLs and S-VOLs behind the control unit. The async options can only be modified when no Async-CA pairs or groups exist in the connected MCU (P-VOLs or S-VOLs). To open the Async Option window, click **Async Option** in the HP Continuous Access main control window.



The CA async options are:

Current Pending Update Data Rate: This option specifies the Async-CA sidefile threshold, which is the maximum amount of cache that can be used for storing Async-CA recordsets (sidefiles). You can select any value between 30% and 70% (10% increments). If one or more C/T groups exist, this setting cannot be changed. This setting can only be changed when no consistency groups are assigned. The current pending update data rate is common to both CA and any BC operations.

When the amount of cache being used for CA (and BC) recordsets reaches the specified threshold value, the MCU/RCU performs cache inflow control as follows:

- The MCU's I/O response is delayed.
- The RCU accepts only the one specific recordset that will enable it to settle the pending recordsets in the queue(s). For all other recordsets the RCU responds to the MCU with the channel-command-retry request.

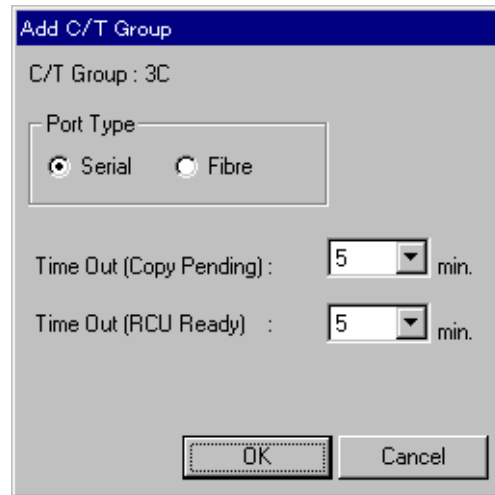
Offloading timer: This option specifies the amount of time, 0-255 seconds, that the MCU will wait to send an Async recordset to the RCU. The MCU will suspend all affected Async volume pairs, if it has not been able to offload a recordset to the RCU within the specified time (for example, the RCU is still responding to channel-command-retry).

The offloading timer value should be set lower than the HBA timeout value.

When channel-extenders are used for Async-CA, the offloading timer should be set to 35 seconds or less to avoid affecting host I/O performance.

Adding consistency groups

1. Start Remote Control, connect to the desired MCU, and start CA.
2. Make sure that the async options are configured as desired. In the HP Continuous Access main control window, select the desired (unassigned) group, and click **Add Group...** to open the Add C/T Group window. The Add C/T Group window displays the selected group number (0-F).



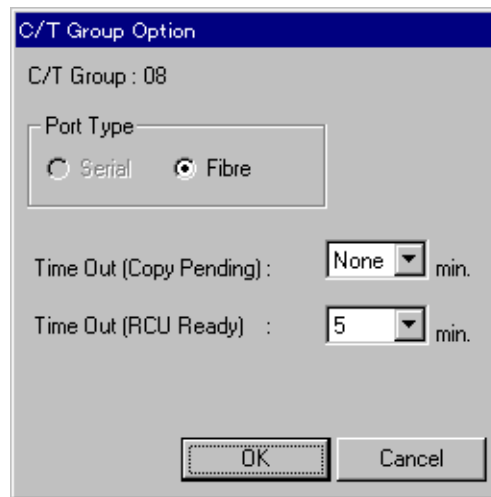
3. In the Add C/T Group window, select the port type (ESCON or fibre).
4. Set the copy pending timeout and RCU ready timeout. Remember that you will not be able to modify these options later.

A timeout occurs when the RCU is not able to settle a recordset within the specified time, or when the RCU has received communication from one of the MCUs in the group within the specified time. The default copy pending timeout value is 5 minutes.

5. After selecting the desired port type and group options, click **OK** to add the specified group to the MCU. The group is now assigned on the HP Continuous Access main control window.

Changing consistency group options

1. Start Remote Control, connect to the desired MCU, and start the CA software.
2. Split all pairs in the group (pairsplit-R), so that you can change the group options.
3. In the HP Continuous Access main control window, select the desired group, and then click **Group Option...** to open the C/T Group Option window. If **Group Option...** is not enabled, you need to split the remaining pairs in this consistency group.



4. Set the copy pending timeout and RCU ready timeout. Remember that you will not be able to modify these options later.

A timeout occurs when the RCU is not able to settle a recordset within the specified time, or when the RCU has received communication from one of the MCUs in the group within the specified time. The default copy pending timeout value is 5 minutes.

5. When you are finished changing group options, resync all pairs in the group (pairresync).

Viewing consistency group status

The Group Status window displays the detailed status information for the selected consistency group. The group status can be displayed at both the MCU and RCU. Table 7 describes the information displayed on the Group Status window. To open the Group Status window, click **Group Status** in the HP Continuous Access main control window.

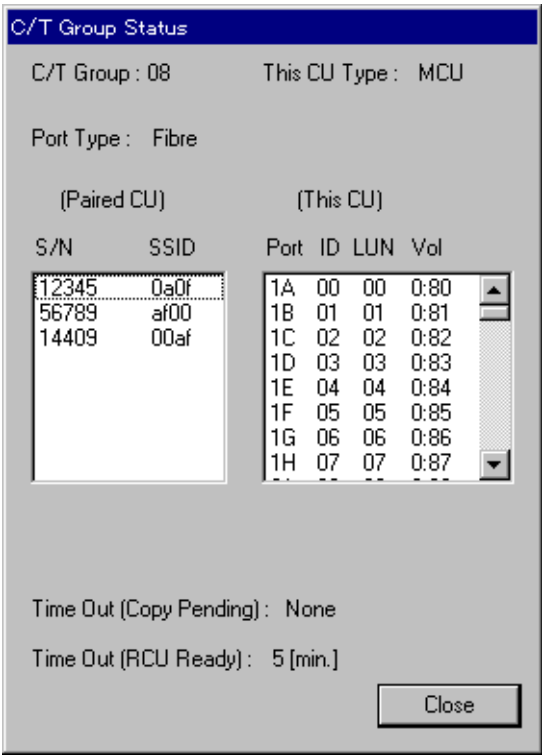


Table 7. Consistency group status

Item	Description	Displayed by:	
		MCU	RCU
C/T Group	Consistency group number (0-F, hexadecimal).	Yes	Yes
This CU Type	CU type (MCU, RCU, M&R) of connected disk array.	Yes	Yes
Port Type	ESCON or Fibre.	Yes	Yes
Paired CU	S/N and SSID(s) of the other CU for this group.	Yes	No
This CU	Volumes in the connected disk array which belong to this group (port, TID, LUN, CU:LDEV).	Yes	Yes
Time Out (Copy Pending)	Specified copy pending timeout group option.	Yes	Yes
Time Out (RCU Ready)	Specified RCU ready timeout group option.	Yes	No

Deleting consistency groups

A consistency group can be deleted only from the MCU and only if the MCU does not contain any P-VOLs still assigned to the group. Deleting a consistency group from an MCU does not affect the consistency groups registered at other MCUs. The RCU will automatically delete a consistency group when the last volume pair in the group is deleted.

The **Delete Group** button on the HP Continuous Access main control window allows you to delete the selected group from the current MCU. The MCU will not allow you to delete a group which still has P-VOLs in the current MCU.

To delete a consistency group from an MCU:

1. Start Remote Control, connect to the desired MCU, and start the CA software.
2. On the HP Continuous Access main control window, select the group to be deleted, and then click **Delete Group**. If the Delete Group button is not enabled, the selected group still contains P-VOLs in this MCU.
3. When the confirmation window appears, click **OK** to delete the selected group. The MCU clears the group assignment information for the selected group.

Pair operations

CA performs remote copy operations for logical volume pairs that you establish. This chapter explains how to perform various pair operations.

The start of CA operations is to create P-VOL and S-VOL volume pairs at the primary and secondary sites, respectively. Before you begin creating volume pairs you need to do the following preparations:

- Identify the P-VOLs and S-VOLs by port, TID, and LUN and/or by LDEV ID.
- Identify volumes containing important data to be backed up.
- Ensure all system and CA requirements have been met.
- Complete hardware and software installation.
- Configure the MCUs and RCUs for CA operations.
- For CA disaster recovery operations, attach the RCUs to a host server to enable reporting of sense information and transfer of host failover information.
- If the remote site is unattended, attach the RCUs to a host server at the main site so the system administrator can monitor the RCUs.
- For large databases spanning multiple volumes, establish an Async-CA consistency group for each database, so the update sequence consistency of the database can be ensured at the remote site.

Creating volume pairs (Paircreate)

The Paircreate window allows you to add one or more new CA pairs. To open the Paircreate window, click the **Paircreate...** button on the HP Continuous Access main control window.

The Paircreate window allows you to select the RCU, S-VOL, and initial copy options for the pair(s) being created. When you click **OK** on the Paircreate window, the Pair Option window opens to allow you to select initial copy options for the new pair(s).

When you click **OK** on the Pair Option window, the Pair List (Paircreate) window opens and displays the pair(s) being created. The Pair List (Paircreate) window allows you to change the initial copy options and pair options for each pair, remove pair(s) from the list, and start the specified CA pair(s). Make sure to select the appropriate CU image before creating any CA pairs.

Paircreate

Port ID LUN

P-VOL: 1N 01 00

Port ID LUN

S-VOL:

RCU:

Priority: 32

Initial Copy

☒ Entire Volume

☐ None (must be already synchronized)

Copy Mode

☒ Synchronous

☐ Asynchronous

C/T Group:

OK

Cancel

Pair Option

Initial Copy Pace

Tracks

Error Level (Async)

☒ Group

☐ LU

P-VOL Fence Level

☐ S-VOL Data

☐ S-VOL Status

☒ Never

Resume Range (Async)

☐ Group

☐ LU

OK

Cancel

Pair List (Paircreate)

☒ Use Time-Saving Mode

Port ID	Lun	Emulation	S/N	SSID	Port ID	Lun	Priority	Mode	Sync	Grp	Lv
1A	00	00	OPEN-3	35005	00f0	2P	0f	02	032	Entire	Sync
1B	01	01	OPEN-3	35005	00f0	2P	0f	03	032	Entire	Sync

110

HP StorageWorks Continuous Access XP User's Guide

To create one or more new CA volume pairs:

1. Make sure the CA volumes that will be S-VOLs are offline from all hosts.
2. Start the Remote Console software, connect to the disk array, which contains the P-VOLs of the pair(s) you are creating, and start the CA software. The MCU and RCU ports must already be configured, and the RCU(s) must already be added.
3. In the HP Continuous Access main control window, select the desired CU image, and then select the volume(s) that will be the P-VOL(s) of the CA pair(s). The pair status must be SMPL. You can select more than one volume and establish more than one pair at a time only if the S-VOLs are in the same RCU and the pairs will have the same copy mode (Sync or Async). You cannot start Sync-CA and Async-CA pairs at the same time.
4. Click **Paircreate...** to open the Paircreate window. If you selected more than one volume in step (3), the Paircreate window displays the volume with the lowest ID as the P-VOL.

Paircreate

Port	ID	LUN	Port	ID	LUN
P-VOL :	1N	01	00	S-VOL :	

RCU : Priority : 32

Initial Copy

☒ Entire Volume

☐ None (must be already synchronized)

Copy Mode

☒ Synchronous

☐ Asynchronous C/T Group :

OK Cancel Option...

5. In the Paircreate window, select the **RCU**, enter the desired **S-VOL** for the P-VOL.

6. Select the desired initial copy options:

Priority specifies the order in which initial copy operations will be performed (if the number entered is greater than the maximum initial copy activity setting on the RCU Option window). The highest priority is 1, the lowest is 256 (default = 32). The priority option can be used to spread initial copy operations across array groups and/or array domains (ACP pairs) to reduce copy time and host I/O contention.

For example, if the maximum initial copy activity setting is four, and you add six pairs at the same time, each with different priority, the MCU will start the initial copy for the first four LUNs with the highest priority immediately, then start the one with the fifth highest priority when the first four are complete, followed by the one with the sixth priority when the fifth is complete. If more CA pairs are created, the MCU also prioritizes the initial copy operations by time requested, so all pairs in the first group are started before any pair in the next group.

Initial Copy specifies the initial copy mode for the new pair(s):

Entire Volume causes the initial copy to copy all P-VOL cylinders (except diagnostic and unassigned alternate tracks) to the S-VOL.

None prevents the initial copy operation from being performed. The MCU will begin performing update copy operations as needed.

Caution *The user must ensure that the P-VOL and S-VOL are already identical when using this setting.*

Copy Mode specifies the update copy mode for the new pair(s):

Synchronous or Asynchronous. The selection of mode has the greatest impact on performance and must be considered carefully. Factors in mode selection include (but are not limited to) the use of CA (for disaster recovery or migration), the number of pairs, and the write I/O activity to the P-VOLs.

C/T Group: This option specifies the consistency group for the new pair(s) (Async only). All Async-CA pairs must be assigned to a consistency group.

7. Click **OK** to open the Pair Option window. In the Pair Option window, select the desired CA pair options (described below).

The screenshot shows a 'Pair Option' dialog box. It has a title bar with the text 'Pair Option'. The dialog is divided into four main sections. The top-left section is 'Initial Copy Pace' and contains a text box with the number '15' and the label 'Tracks'. The top-right section is 'Error Level (Async)' and contains two radio buttons: 'Group' (which is selected) and 'LU'. The bottom-left section is 'P-VOL Fence Level' and contains three radio buttons: 'S-VOL Data', 'S-VOL Status', and 'Never' (which is selected). The bottom-right section is 'Resume Range (Async)' and contains two radio buttons: 'Group' and 'LU'. At the bottom of the dialog are two buttons: 'OK' and 'Cancel'.

The available pair options are:

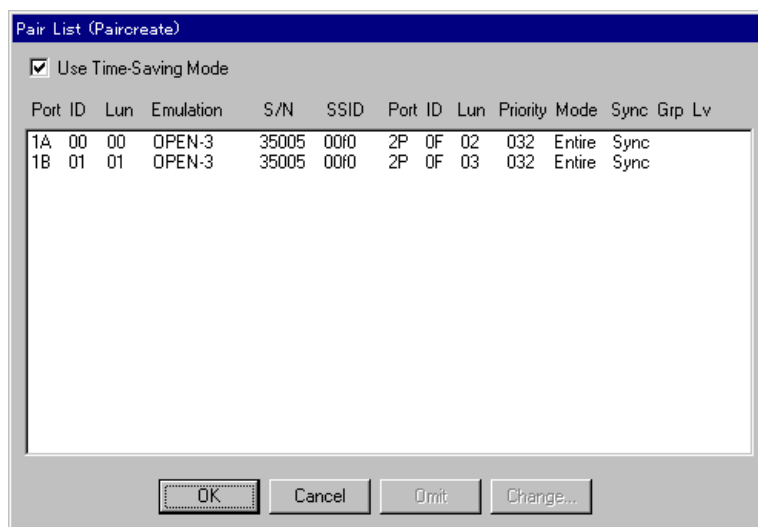
Initial Copy Pace specifies the maximum number of tracks (1-15) that can be copied at one time before the MCU accepts another host request for that P-VOL. A high setting speeds up copying but slows disk array I/O. A low setting slows copying but has less effect on I/O.

P-VOL Fence Level (Synchronous only) specifies the conditions under which the MCU will reject P-VOL write operations, which is known as “fencing.” If **S-VOL Data** is selected, the P-VOL will be fenced when the MCU cannot successfully execute an update copy. If **Never** is selected, the P-VOL is never fenced.

Error Level (Async) specifies the error level for the CA Async pair(s). If **Group** is selected, a failure suspends all pairs in the group. Use this setting for volumes essential to disaster recovery. If **LU** is selected, only the pair affected by a failure is suspended.

8. Click **OK** to close the Pair Option window.

9. The Pair List (Paircreate) window now opens and displays all pairs being created. If you selected more than one volume in step (3), S-VOLs are automatically assigned to the rest of the P-VOLs based on TID/LUN. The initial copy options and pair options you selected are applied to all pairs, but you can customize the options for each pair as needed.



10. In the Pair List (Paircreate) window, check the RCU S/N and SSID, S-VOL, and copy options for each pair. If you need to change the options for one or more pairs, select the pair(s), click **Change...** to re-open the Paircreate window, make the desired changes (click **Option...** to access the pair options), and click **OK** to return to the Pair List (Paircreate) window. Repeat this step until all CA options for each new pair are correct.
11. If you want to execute the paircreate requests quickly, select the **Use Time-Saving Mode** option on the Pair List (Paircreate) window.
12. Click **OK** on the Pair List (Paircreate) window to create (start) the specified CA pair(s). The MCU will start the initial copy operations according to the initial copy priority and the maximum initial copy activities setting.

13. In the HP Continuous Access main control window, verify that the new CA pair(s) is/are displayed correctly (COPY status) in the **Volume List** box. To monitor the status of the new pair(s), use the **Refresh** button to update the information in the **Volume List** box, or use the Pairdisplay window to monitor the detailed status of each pair.

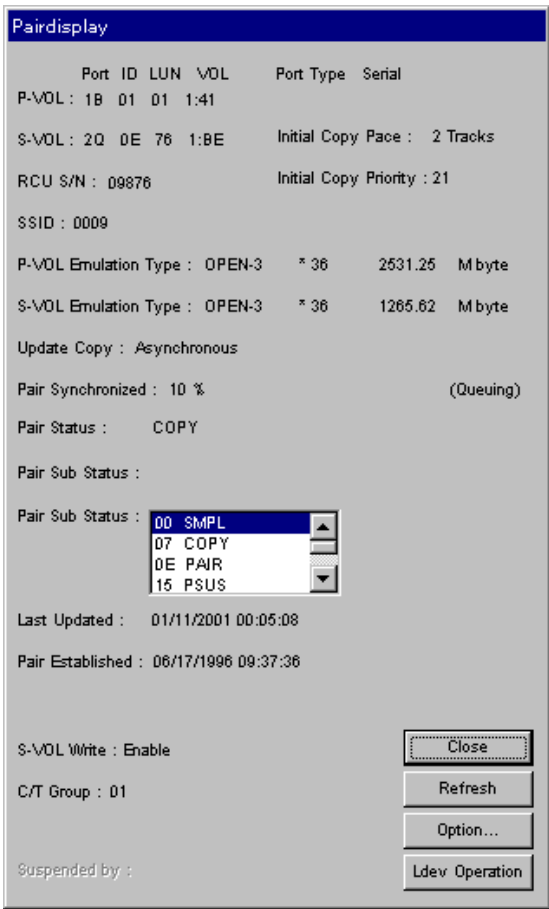
The Paircreate operation will be rejected if the P-VOL is in the correction access or correction copy status. If this occurs, wait for the volume status to change and then repeat this procedure. If the status is not displaying correctly, make sure that the correct CU image is selected.

If a timeout error occurs when the **Use Time-Saving Mode** option is selected, confirm in the HP Continuous Access main control window for which volumes the paircreate operation could not be performed. Deselect the **Use Time-Saving Mode** option for the failed volumes, and retry the paircreate operation.

Viewing pair status (Pairedisplay)

The Pairedisplay window shows the detailed status of a CA volume (LU) pair and provides access to the LDEV Operation window and Pair Option window.

To open the Pairedisplay window, select the desired pair in the HP Continuous Access main control window, and then click the **Pairedisplay...** button.



The **Refresh** button renews the information in the Pairedisplay window.

The **Option...** button opens the Pair Option window, which displays and allows you to change the pair options for the selected pair.

The **Ldev Operation** button opens the LDEV Operation window, which displays CA information for individual LDEV pairs within a LUSE pair.

The Pairedisplay window shows the following information for the CA volume (LU) pair selected in the CA main control window:

Port Type: Serial (ESCON) or Fibre Channel.

P-VOL and S-VOL: Port, SCSI TID, LUN, and LDEV ID of the LUs. For a LUSE pair the first LDEV is listed.

RCU S/N, SSID: Serial number and SSID of the RCU (or MCU if S-VOL is selected).

Initial Copy Pace: 1-15 tracks (disabled when status becomes PAIR).

Initial Copy Priority: 1-256 (disabled when the status becomes PAIR).

Emulation Type: LU type and capacity (MB) of the P-VOL and S-VOL.

Update Copy: Synchronous or asynchronous.

Pair Synchronized: Progress of initial copy. If you select an S-VOL, an Async-CA pair, or a split/suspended pair in the HP Continuous Access main control window, this field displays **Not valid**.

Pair Status: SMPL, COPY, PAIR, PSUS, PSUE, PDUB, suspending, or deleting. If the pair is split or suspended, the split/suspend type is displayed.

Pair Sub Status: Status of each LDEV pair contained in the LUSE pair.

Last Updated: Date and time that the volume pair status was last updated.

Pair Established: Date and time that the volume pair was created.

Pair Suspended: Date and time that the volume pair was split/suspended (displayed only when the pair status is PSUS/PSUE).

S-VOL Write: Enabled or disabled for this pair (enabled only when split).

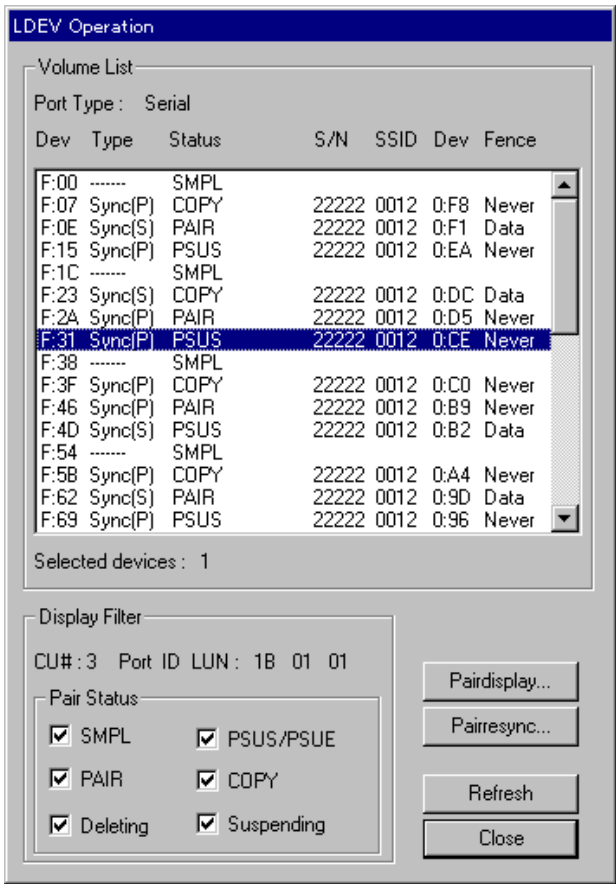
C/T Group: Consistency group to which the Async-CA pair is assigned.

Suspended by: Consistency status (group or LU) of the split or suspended Async-CA pair (displayed only at the RCU).

Viewing pair status for LDEVs

The Pairedisplay window can also display the CA pair status of an LDEV pair, which is part of a CA LUSE pair. To view pair status information for an LDEV pair, in the main control window select the volume which contains the desired LDEV, open the LDEV Operation window, select the desired LDEV, and click **Pairedisplay...**

The LDEV Operation window displays CA information for individual LDEV pairs within CA LUSE pairs. The LDEV Operation window also provides access to the pairedisplay and pairresync operations for individual LDEV pairs.



The **Volume List** box displays the following information for each LDEV in the selected LU:

- **Port Type:** Serial/ESCON or fibre (FC)
- **Dev:** CU image:LDEV ID.
- **Type:** Pair type (Sync or Async, primary or secondary).
- **Status:** Pair status (SMPL, COPY, PAIR, PSUS/PSUE, Suspending, or Deleting).
- **S/N, SSID, Dev:** Disk array S/N, SSID, and LDEV ID of the other LDEV in the pair.
- **Fence:** Fence level of the pair (Data, Status, or Never).

The **Display Filter** box displays the selected LU (CU image, port, SCSI TID, LUN) and allows you to filter the LDEVs displayed in the Volume List box by pair status (same as in the HP Continuous Access main control window).

The **Pairedisplay...** button opens the Pairedisplay window, which displays the detailed CA status information for the selected LDEV.

The **Pairresync...** button opens the Pair List (Pairresync) window, which allows you to restart the selected split or suspended LDEV pair.

The **Refresh** button renews the information displayed in the window.

The Pairedisplay window shows the status of the selected LDEV pair.

The Pairedisplay window displays the following information:

Port	ID	LUN	VOL	Port Type	Serial
P-VOL	1B	01	01	0:41	
S-VOL	2Q	0E	76	0:BE	

Initial Copy Pace : 2 Tracks
Initial Copy Priority : 21
RCU S/N : 09876
SSID : 0009

P-VOL Emulation Type : OPEN-3 * 36 84518.43 M byte
S-VOL Emulation Type : OPEN-3 * 36 84518.43 M byte

Update Copy : Asynchronous
Pair Synchronized : 10 %
Pair Status : COPY
Pair Sub Status :
Pair Sub Status : 00 COPY
07 COPY
0E COPY
15 COPY
Last Updated : 01/11/2001 00:05:08
Pair Established : 06/17/1996 09:37:36

S-VOL Write : Enable
C/T Group : 01
Suspended by :

Buttons: Close, Refresh, Option..., Ldev Operation

The following table explains the meaning of each pair status displayed in the Pairedisplay or LDEV operation window.

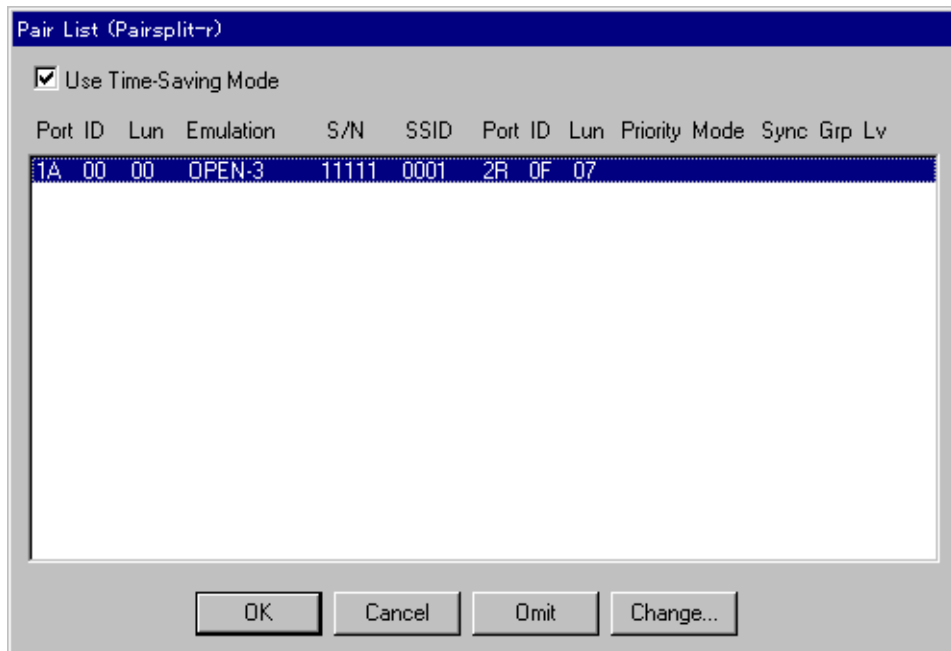
Table 8. CA volume pair status

Pair Status	Description	P-VOL Access	S-VOL Access
SMPL (simplex)	This volume is not currently assigned to a CA volume pair. When this volume is added to a CA pair, its status will change to COPY.	Read/write	Read/write
COPY	The initial copy operation for this pair is in progress. This pair is not yet synchronized. When the initial copy is complete, the status changes to PAIR.	Read/write	Read only
PAIR	This pair is synchronized. Updates to the P-VOL are duplicated on the S-VOL.	Read/write	Read only
PSUS (pair suspended- split)	This pair is not synchronized, because the user has split this pair (pairsplit-R), or because the user has deleted this pair from the RCU (pairsplit-S). For Async-CA pairs, the MCU and RCU keep track of any recordsets that were discarded during the pairsplit-R operation. While a pair is split, the MCU and RCU keep track of the P-VOL and S-VOL cylinders which are updated. You must delete the pair from the MCU in order to change the P-VOL status to SMPL.	Read/write	Read only; Read and write, if write enable split option is selected.
PSUE (pair suspended, error)	This pair is not synchronized, because the MCU or RCU has suspended the pair due to an error condition. For Async-CA pairs the MCU and RCU keep track of any recordsets that were discarded during the suspension operation. The MCU keeps track of the P-VOL cylinders which are updated while the pair is suspended.	Read/write; Read only if fenced.	Read only

Pair Status	Description	P-VOL Access	S-VOL Access
Pair Status for CA LUSE volumes only:			
PDUB (Pair status Dubious)	This CA pair consists of LUSE volumes (for example, OPEN3*n), and an individual LDEV within this CA LUSE pair has failed due to some error condition. The overall status of the CA LUSE volume is PAIR or COPY, except the status of one or more LDEV pairs, which is PSUE or SMPL.	Read/write	Read only
Pair Status for Async-CA only:			
Suspending	This pair is not synchronized. This pair is in transition from PAIR or COPY to PSUS/PSUE. When the split/suspend pair operation is requested, the status of all affected pairs changes to Suspending . When the split/suspend operation is complete, the status changes to PSUS/PSUE.	Read/write	Read only
Deleting	This pair is not synchronized. This pair is in transition from PAIR, COPY, or PSUS/PSUE to SMPL. When the pairsplit-S operation is requested, the status of all affected pairs changes to Deleting . When the pairsplit-S operation is complete, the status changes to SMPL.	Read/write	Read only

Splitting pairs (Pairsplit-R)

The Pair List (Pairsplit-r) window displays information for the selected pair(s) and allows you to split pairs for volume maintenance purposes. To open the Pair List (Pairsplit-r) window, click the **Pairsplit-R...** button on the HP Continuous Access main control window.



The window displays the following information for the selected pair(s):

- Port, ID, LUN, and Emulation** type of the selected LU.
- S/N** and **SSID** of the RCU (MCU if you are connected to the RCU).
- Port, ID, and LUN** of the S-VOL (P-VOL if connected to the RCU).
- Priority:** Initial copy priority (blank after initial copy operation).
- Mode:** The drain or purge pairsplit-R option (Async only).
- Sync:** The update copy mode: Sync or Async.
- Grp:** The consistency group to which the pair belongs (Async LUs only).
- Lv:** The error level of the pair (group or LU) (Async LUs only).

To split CA volume pairs:

1. Connect to the MCU (or RCU) of the volume pair(s) to be split. You do not need to take the P-VOL(s) offline. To use the S-VOL write enable option, connect to the MCU and select the P-VOL of the pair.
2. In the HP Continuous Access main control window select the correct CU image, and then select the CA volume pair(s) that you want to split. Select either Sync-CA or Async-CA pairs, but not both. The pair status must be **PAIR**.
3. Click **Pairsplit-R...** to open the Pair List (Pairsplit-r) window, which displays the selected pair(s). To remove one or more pairs from this window, select the pair(s) and then click the **Omit** button.
4. To change the pairsplit options for one or more pairs, select the pair(s) and then click **Change...** to open the Pairsplit-R Option window. On the Pairsplit-R Option window, select the desired options for the pair(s), and then click **OK** to return to the Pair List (Pairsplit-r) window. Repeat this step as needed until the pairsplit options for each pair are correct.

See the description of the [“Pairsplit-R Option window”](#) that follows for an explanation of the options.

Caution

*If you need to split a pair and the P-VOL is required for system operation, do not use the **P-VOL Failure** suspend kind option. Use the **S-VOL** suspend kind option so that the P-VOL continues accepting I/Os.*

5. If you want to execute the pairsplit requests quickly, click the **Use Time-Saving Mode** option in the Pair List (Pairsplit-r) window.
6. Click **OK** on the Pair List (Pairsplit-r) window to split the specified pair(s). For Sync-CA pairs, the MCU will complete P-VOL write operations in progress and associated update copy operations at the S-VOL before splitting the pair so the pair is synchronized.
7. In the HP Continuous Access main control window, verify that the CA pair(s) is/are displayed correctly (**PSUS** status) in the **Volume List** box. The Pair List (Pairresync) window allows you to resync split CA volume pair(s).

8. If a timeout error occurs when the **Use Time-Saving Mode** option is selected, confirm in the HP Continuous Access main control window for which volumes the pairsplit-r operation could not be performed. Deselect the **Use Time-Saving Mode** option for the failed volumes, and retry the pairsplit-r operation.

Pairsplit-R Option window

The Pairsplit-R Option window allows you to change the pairsplit-R options for the selected pair(s).



S-VOL Write Enable: When this box is checked, the S-VOL of this pair will be available to receive read and write I/Os while the pair is split. If you select this option and you want to resync the pair later, select the **S-VOL** Suspend Kind option to ensure that the P-VOL and S-VOL bitmaps are merged at the MCU. This option is available only when the selected volume is a P-VOL.

Suspend Kind

When **P-VOL Failure** is selected (Synchronous MCU only), the MCU rejects all write I/O operations to the P-VOL while the pair is split, regardless of the P-VOL fence-level setting.

When **S-VOL** is selected, the P-VOL accepts all write I/O operations, and the MCU tracks updates while the pair is split. Write I/O operations to the P-VOL are permitted or rejected, depending on the fence level of the pair.

Suspend Range (Async)

Group: The MCU/RCU will split all other Async-CA pairs in the same consistency group as the specified pair(s).

LU: The MCU/RCU will split only the specified Async-CA pair(s) (even if the error level of the pair is group).

Pending Update (Async):

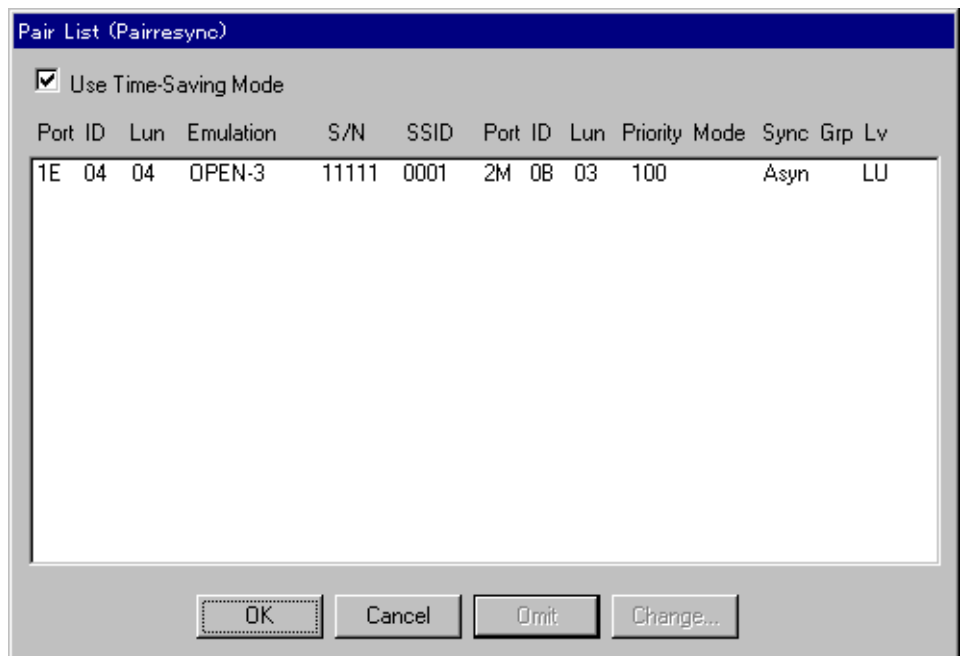
Drain: The MCU changes the Async-CA pair status from **Suspending** to **PSUS** only after the RCU accepts the pairsplit operation, finishes settling all pending recordsets for the pair, and completes the negotiation with all MCUs (report ready-for-suspension to all MCUs and receive their acknowledgements) without further recordsets generated. If the RCU is not able to complete these actions within the copy pending timeout setting, the RCU discontinues the original pairsplit-R request and suspends the affected Async-CA pairs. You can use the copy pending timeout parameter to limit the amount of time to complete the split-drain operation.

Purge: The MCU changes the Async-CA pair status from **Suspending** to **PSUS** as soon as the RCU accepts the pairsplit operation. The MCU and RCU discard pending recordsets and mark the cylinders that contain discarded recordsets as modified in the P-VOL and S-VOL bitmaps, respectively. When the pair is resumed (pairresync), the P-VOL and S-VOL bitmaps will be merged at the MCU, and all cylinders marked as modified will be copied to the S-VOL. If the MCU does not receive acknowledgement of the pairsplit-R operation from the RCU within the copy pending timeout setting, the MCU suspends all affected pairs.

Resuming volume/LDEV pairs (Pairresync)

The Pair List (Pairresync) window allows you to resume split/suspended CA pairs and select the pairresync options for each pair. The Pair List (Pairresync) window can be accessed from either the HP Continuous Access main control window or the LDEV Operation window (**Pairresync...** button)

The Pair List (Pairresync) window displays the same information for the selected pair(s) as the Pairsplit-R window ([page 123](#)).



While a CA pair is split or suspended, the MCU does not perform any update copy operations to the S-VOL. For a split/suspended Sync-CA pair, the MCU may or may not continue accepting write I/Os for the P-VOL depending on the P-VOL fence level and pairsplit options (if user-requested). For a split/suspended Async-CA pair, the MCU and RCU keep track of any recordsets that were discarded during pairsplit/suspension, and the MCU continues to accept write I/Os for the

P-VOL. The MCU keeps track of the P-VOL cylinders, which are updated while the pair is split/suspended. If the RCU accepts write I/Os for a split S-VOL (S-VOL write enable), the RCU also keeps track of the S-VOL cylinders, which are updated. When the split/suspended pair is resumed, the MCU merges the P-VOL and S-VOL cylinder bitmaps to determine the out-of-sync cylinders.

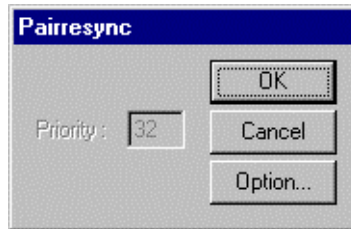
If an MCU/RCU is powered off and its backup batteries are fully discharged while CA pairs are suspended, the P-VOL/S-VOL cylinder bitmaps will not be retained. In this unlikely case, the MCU/RCU will mark all cylinders of all split or suspended CA volumes as modified, so that the MCU will perform the equivalent of an entire initial copy operation when the pairs are resynced.

To resync volume pairs:

1. If any pair was suspended due to an error condition (use the Pairdisplay window to view the suspend type), make sure the error condition has been removed. The MCU will not resync the pair(s) with errors.
2. Connect to the MCU of the pair(s) to be resumed, and start the CA software.
3. In the HP Continuous Access main control window, select the CU image.
4. If you are resyncing split or suspended LUs, select the desired pair(s) in the HP Continuous Access main control window, and click **Pairresync...** to open the Pair List (Pairresync) window.

Select PSUS or PSUE pairs (not both). Select either Sync or Async pairs (not both). If you plan to use the **Resume Range-Group** option, select only one Async-CA pair in the group.
5. If you are resyncing suspended LDEV pairs within a CA LUSE pair, select the desired CA pair in the HP Continuous Access main control window, click **Ldev Operation** to open the LDEV Operation window, select the LDEV pair(s) to be resynced, and then click **Pairresync...** to open the Pair List (Pairresync) window.
6. The Pair List (Pairresync) window displays the CA LU or LDEV pair(s) to be resynced. To remove one or more pairs from the window, select the pair(s) and then click **Omit**.

7. To change the priority and/or pair options for one or more pairs, select the desired pair(s), and click **Change...** to open the Pairresync Option window.



8. Enter the desired priority (1-256) for the resync operation, which determines the order in which the resync operations will be performed. **OK** applies the priority.

Option... opens the Pair Option window to allow you to change the pair options: **Initial Copy Pace** (for the resync copy operation), **P-VOL Fence Level** (Sync only), and **Error Level** (Async only). The **Group resume range** option allows you to resync all split or suspended pairs in the same group as the selected pair(s). The **LU resume range** option allows you to resync only the selected pairs.

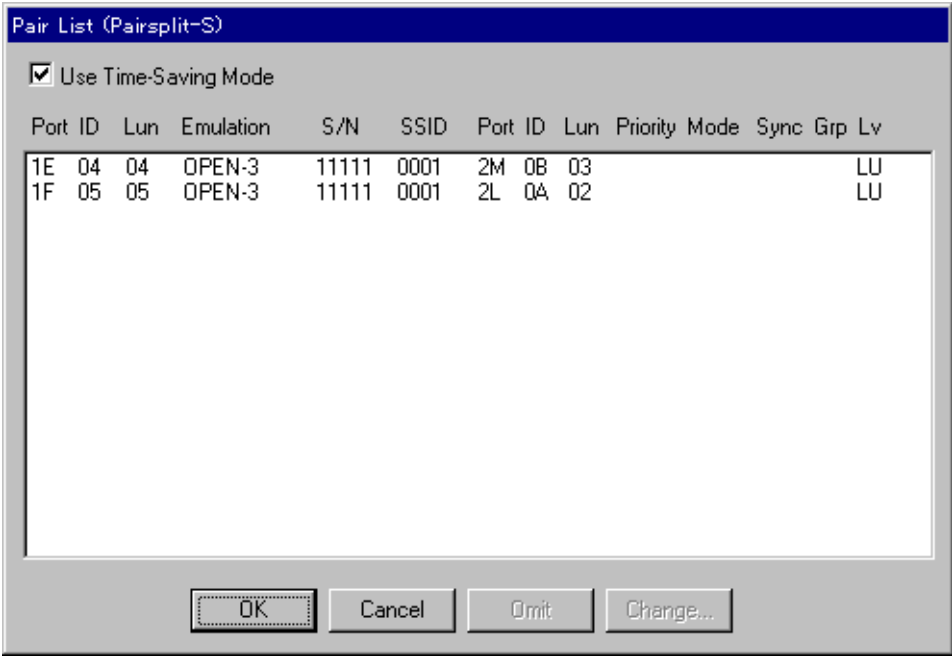
9. Click **OK** until you return to the Pair List (Pairresync) window. Repeat this procedure until resync and pair options for each pair are correct.
10. If you want to execute the pairresync requests quickly, click the **Use Time-Saving Mode** option in the Pair List (Pairresync) window.
11. Click **OK** in the Pair List (Pairresync) window to resync the pair(s).
12. In the HP Continuous Access main control window or LDEV Operation window, verify that the CA pair(s) is/are displayed correctly (COPY or PAIR status) in the **Volume List** box.

If a timeout error occurs when the **Use Time-Saving Mode** option is selected, confirm in the HP Continuous Access main control window for which volumes the pairresync operation could not be performed. Deselect the **Use Time-Saving Mode** option for the failed volumes, and retry the pairresync operation.

Deleting volume pairs (Pairsplit -S)

The Pair List (Pairsplit-S) window allows you to delete one or more CA pairs and also provides access to the Pairsplit-S Option window. Only the relationship between the volumes is deleted

To open the Pair List (Pairsplit-S) window, click the **Pairsplit-S...** button in the HP Continuous Access main control window. The Pair List (Pairsplit-S) window displays the same information for the selected pair(s) as the Pairsplit-R window ([page 123](#)).



A CA pair should be deleted from the MCU only when it is no longer necessary to maintain a remote copy of the P-VOL. When a CA pair is deleted from the MCU, the MCU stops all CA copy operations for that pair and changes the pair status of the P-VOL and S-VOL to SMPL. After a CA pair is deleted, the MCU continues to accept write I/O operations to the P-VOL but will not keep track of the P-VOL updates.

A CA pair should be deleted from the RCU only for disaster recovery. When a CA pair is deleted from the RCU, the RCU changes the S-VOL status to **SMPL** but does not change the pair status of the corresponding P-VOL. When the MCU performs the next CA operation, the MCU detects that the S-VOL status has changed and changes the P-VOL status to **PSUS-pairsplit-S to RCU**.

To restart a pair that was deleted from the RCU, you must first delete the pair from the MCU, and then create the pair from the MCU using the appropriate initial copy option (**Entire Volume** or **None**) to restart the pair.

If you want to delete all Async-CA pairs in a consistency group, delete the pairs from the MCU. The CA pair status will change to **Deleting** when the pairsplit-S operation is accepted by the MCU and RCU, and then to **SMPL** after the internal pairsplit-S process is complete. If you want to delete Async-CA pairs according to their consistency status (such as for disaster recovery), you must delete the pairs from the RCU.

When you delete a CA pair from the RCU, remember that the S-VOL and P-VOL are identical (for example, same volume label), and take appropriate precautions to prevent a system problem due to duplicate volumes.

To delete volume pairs:

1. Connect to the MCU or RCU of the pair(s) to be deleted, and start the CA software. If you plan to use the Async-CA C/T delete range option, you must connect to the RCU.
2. In the HP Continuous Access main control window, select the correct CU image, and select the CA pair(s) that you want to delete. Select either Sync-CA or Async-CA pairs, but not both. If you plan to use the Async-CA C/T or Group delete range option, select only one Async-CA pair in the group.
3. Click the **Pairsplit-S...** button. When the pair delete confirmation message appears, click **Yes** to open the Pair List (Pairsplit-S) window, or click **No** to cancel your pairsplit-S request.

4. The Pair List (Pairsplit-S) window displays the pair(s) selected in the HP Continuous Access main control window. To remove one or more pairs from the Pair List (Pairsplit-S) window, select the pair(s) and then click **Omit**. To change the pairsplit-S options for one or more pairs:

Select the pair(s), and then click **Change...** to open the Pairsplit-S Option window.

In the Pairsplit-S Option window, select the desired pairsplit-S options for the selected pair(s), and then click **OK** to return to the Pair List (Pairsplit-S) window. For details about the options, see the following description of the Pairsplit-S Option window ([page 133](#)).

Repeat step 4 as needed to set the pairsplit-S options for each pair.

5. If you want to execute the pairsplit-S requests quickly, click the **Use Time-Saving Mode** option in the Pair List (Pairsplit-S) window.
6. Click **OK** in the Pair List (Pairsplit-S) window to delete the specified pair(s).
7. When deleting Async-CA pairs, verify that the pairsplit-S request was completed successfully by checking the detailed CA pair status in the Pairedisplay window (should be **SMPL**, not **Deleting** or **Suspended**).

When deleting Sync-CA pairs, verify that the pairsplit-S request was completed successfully by checking the pair status in the HP Continuous Access main control window (SMPL status).

8. To restart a pair which was deleted from the RCU, first delete the pair from the MCU, and then use the Paircreate window with the appropriate CA initial copy option (**Entire Volume** or **None**) to restart the pair.

If a timeout error occurs when the **Use Time-Saving Mode** option is selected, confirm in the HP Continuous Access main control window for which volumes the pairsplit-S operation could not be performed. Deselect the **Use Time-Saving Mode** option for the failed volumes, and retry the pairsplit-S operation.

Pairsplit-S Option window

The Pairsplit-S Option window allows you to change the pairsplit-S options (by force, and Async-CA delete range) for the pair(s) selected in the Pair List (Pairsplit-S) window. The Pairsplit-S Option window can only be accessed from the Pair List (Pairsplit-S) window (**Change...** button).



The **Delete Pair by Force** option allows you to override the restrictions on deleting a CA volume pair. If this option is selected, the pair(s) will be deleted even if the MCU is unable to communicate with the RCU. This option may be used to free a host waiting for device-end from an MCU which cannot communicate with its RCU, thus allowing host operations to continue. If this option is not selected, the pair(s) will only be deleted if the MCU is able to change the pair status of the P-VOL and S-VOL to **SMPL**.

The **Delete Range (Asyn)** box allows you to select the Async-CA delete range option. This option simplifies disaster recovery operations for Async-CA consistency groups at the RCU (secondary (remote) disk array). The Async-CA delete range options are:

C/T (RCU only): When the **C/T** option is selected, the RCU will delete all Async-CA pairs which are in the same group as the specified pair and meet the following conditions: the pair status must be **PSUE**, and the consistency status must be **Group**. This option is used when deleting pairs at the RCU during disaster recovery.

Group (MCU or RCU): When the **Group** option is selected, the MCU/RCU will delete all Async-CA pairs in the same consistency group as the specified pair, regardless of pair status and consistency status.

Caution *Do not use this option when deleting pairs at the RCU during disaster recovery. This option is available only when one pair is selected.*

LU (MCU or RCU): When the **LU** option is selected, the MCU/RCU will delete only the specified Async-CA pair(s). This option can be used to remove individual volumes from consistency groups.

Using CA for data migration and duplication

Sync-CA can be used for device or workload migration with minimal impact to host applications. You may need to migrate data from one volume to another for any of the following reasons:

- To load data onto new or scratch volumes (for example, new or upgraded disk array)
- To temporarily move data off a volume to accommodate other activities (such as repairs)
- To relocate volumes to balance workloads and distribute I/O activity evenly within and across disk arrays for the purpose of improving disk array and system performance

The CA initial copy operation copies the entire contents of the P-VOL to the S-VOL. The P-VOL and S-VOL are identical and synchronized when the initial copy operation completes and the pair status changes from COPY to PAIR. The CA pair is then deleted to change the status of the devices to SMPL, and host high-availability (HA) software can then be used to complete the data migration nondisruptively.

To support host-based application automation, data migration using CA must be managed by integrating the HP Command Control Interface (CCI) software with CA operations and the host HA software functions.

If you need to migrate data from other vendors' storage disk arrays onto the XP disk array, please contact your HP account team.

To use Sync-CA to migrate data:

1. Take the S-VOL(s) offline from all attached hosts. The S-VOLs are the secondary/target volumes onto which you are migrating the data. The P-VOLs (primary/source volumes) can remain online.
2. Connect to the disk array containing the volume(s) to be migrated, and then start the CA software. If not already done, install the remote copy connections and configure the ports (RCPs for ESCON, initiator ports for Fibre Channel, if migrating between disk arrays), and then add the RCUs.
3. In the HP Continuous Access main control window, select the desired CU image and the LU(s) to be migrated, and start the Sync-CA pair(s) using the Paircreate window.
4. Monitor the progress of the paircreate and the status of the pair(s) in the HP Continuous Access main control window. Refresh the window as needed. When the status has changed from COPY to PAIR, the P-VOL and S-VOL are identical and synchronized.
5. If you are not using CCI commands and host software to complete the migration, use the following procedure to stop using the P-VOL(s) and switch to the S-VOL(s):

Stop all host updates to the P-VOL(s).

When all update activity to the P-VOL(s) has stopped, connect to the MCU, select the CU image, and delete the CA volume pair(s)

If the P-VOL(s) and S-VOL(s) are attached to the same host, take the P-VOL(s) offline first, and then bring the S-VOL(s) online. The P-VOL(s) and S-VOL(s) have the same volume labels and cannot be online to the same host(s) at the same time.

If you want to keep the volumes synchronized, establish the same CA pair(s) in the reverse direction using the **None** initial copy option. If the original P-VOL(s) will be temporarily unavailable for update copy operations, you can split the new pair(s) (pairsplit-R) so that the new MCU keeps track of changes.

Start the applications with the S-VOL(s). When the original P-VOL(s) become available, you can resume the pair(s) using the Pair List (Pairresync) window.

Point-in-time (PiT) data duplication using Async-CA

Async-CA enables you to make Point-in-Time (PiT) duplicates of groups of volumes. The Async-CA **Group** and **Drain** pairsplit-R options can be used together to create a PiT copy, relative to an application, of an entire Async-CA consistency group of volumes. To produce a PiT duplicate of an existing Async-CA consistency group:

1. Stop all host updates to all Async-CA P-VOLs in the group.
2. After all P-VOL updates have completed, split the Async-CA group using the **Group** and **Drain** pairsplit-R options. If you are splitting the group at the main site, issue the pairsplit-R/group command to one P-VOL in the MCU. If you are splitting the group at the remote site, issue the pairsplit-R/group command to one S-VOL in the RCU.

The copy pending timeout setting for the group determines the maximum amount of time that the pairsplit-R/drain operation can take.

3. When the status of all Async-CA pairs in the group has changed to **PSUS**, the duplicate set of volumes is complete. If desired, you can restart the application at the main site.

CA status snapshot function

The CA status snapshot function writes the user-selected CA pair status information to a text file on the remote console PC. The status information reported in this file is determined by the selections in the Display Filter window. You can use this function to verify completion of your CA operations. Table 9 describes the Snapshot function. Below the table is an example of a CA status snapshot file. (The use of the term "snapshot" in this context refers to a snapshot of volume status. No user data is involved.)

Table 9. Status snapshot function

File name	casnap.txt
File location	c:\Hirmc\histlog\ (where c:\Hirmc = Remote Control installation folder)
Data format	Text file
Target data	The CA pairs to be reported are determined by the selections in the Display Filter window.
Initialization	Each time the Snapshot button is selected, the previous status data is deleted and the new data is written.

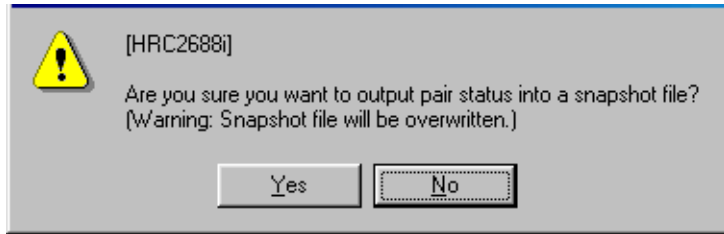
<Snapshot at 10/02/00 14:56:24>

S/N	SSID	Port:Id:Lun	M-VOL	Port:Id:Lun	R-VOL	Type	Emulation	Prio	Sync	Status	Establish	Update
03456	0004	1E 0F 00	00:20	1E 0F 08	00:28	Sync	OPEN-3	032	010	COPY	10/02/2000 14:54:28	10/02/2000 14:54:28
03456	0004	1E 0F 01	00:21	1E 0F 09	00:29	Sync	OPEN-3	032	010	COPY	10/02/2000 14:54:29	10/02/2000 14:54:29
03456	0004	1E 0F 02	00:22	1E 0F 0A	00:2A	Sync	OPEN-3	032	010	COPY	10/02/2000 14:54:30	10/02/2000 14:54:30
03456	0004	1E 0F 03	00:23	1E 0F 0B	00:2B	Sync	OPEN-3	032	010	COPY	10/02/2000 14:54:31	10/02/2000 14:54:31
03456	0004	1E 0F 04	00:24	1E 0F 0C	00:2C	Sync	OPEN-3	032	000	COPY	10/02/2000 14:54:34	10/02/2000 14:54:34
03456	0004	1E 0F 05	00:25	1E 0F 0D	00:2D	Sync	OPEN-3	032	000	PSUS	10/02/2000 14:54:35	10/02/2000 14:54:35
03456	0004	1E 0F 06	00:26	1E 0F 0E	00:2E	Sync	OPEN-3	032	000	PSUS	10/02/2000 14:54:36	10/02/2000 14:54:36
03456	0004	1E 0F 07	00:27	1E 0F 0F	00:2F	Sync	OPEN-3	032	000	PSUS	10/02/2000 14:54:37	10/02/2000 14:54:37
03456	0004	1E 0F 10	00:30	1E 0F 12	00:32	Asyn	OPEN-3	032	000	PSUS	10/02/2000 14:56:02	10/02/2000 14:56:02

Figure 23. Example of CA status snapshot file

To create a CA status snapshot file:

1. Open the Display Filter window, select the desired options, and then close the Display Filter window.
2. Click **Snapshot** in the main control window. When the confirmation message appears, click **Yes** to create a new status snapshot file, or click **No** to cancel your request to create a status snapshot file.



3. If you clicked **Yes**, the CA status snapshot file is created in the c:\Hirmc\histlog\ directory, and a completion message is displayed. The status snapshot file lists the CA pairs currently displayed in the main control window.



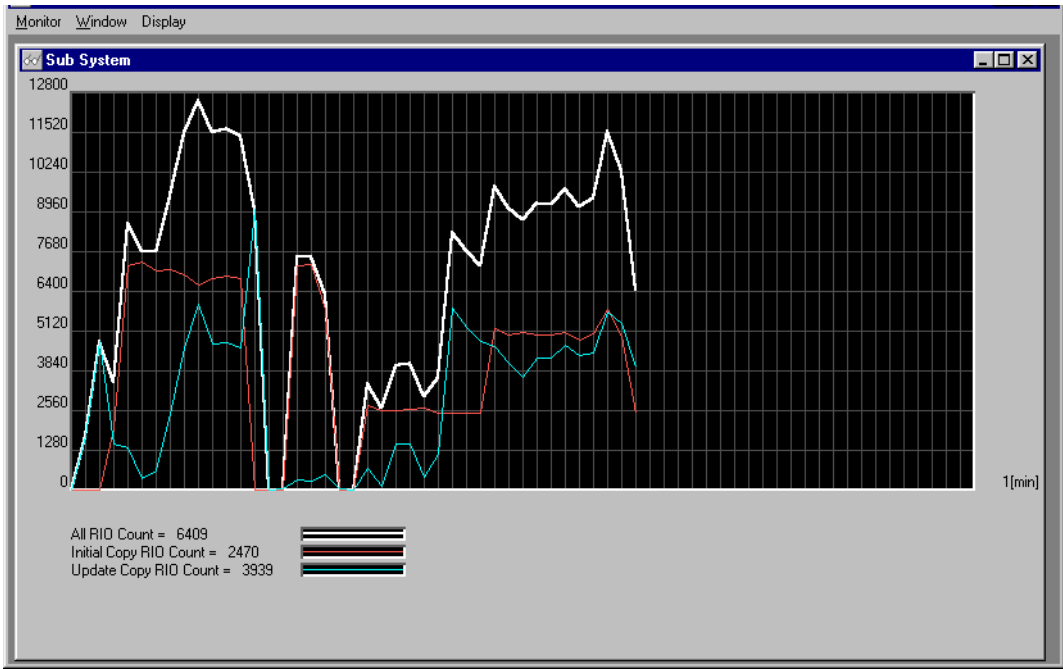
4. Use a text editor (for example, Notepad, WordPad) to open, view, and print the status snapshot file.

Monitoring remote copy activities

The Remote Copy Monitoring window displays the user-selected remote copy I/O statistics for either all LDEVs or the selected LDEVs in the connected disk array. To open the Remote Copy Monitoring window, click **Usage** in the HP Continuous Access main control window. Remote copy monitoring is available to all remote console PC users.

Table 10 lists and describes the remote I/O (RIO) statistics displayed on the Remote Copy Monitoring window. The RIO is a special I/O operation which transfers data to the RCU in FBA format (not CKD) using a single channel command, eliminating the overhead associated with FBA-CKD conversion and thus providing more efficient transfer of user data.

The RIO statistics include both CA and mainframe remote copy operations (total RIO count = CA RIOs + BC RIOs), unless otherwise specified (restore copy IO counts apply to internal use only).



The Monitoring window plots the user-selected I/O statistics on an x-y graph. The x-axis displays time, and the y-axis displays the number of I/Os during the last sampling period.

The user-selected data sampling rate is displayed to the right of the graph area, and the graph is updated at each sampling time.

The user-selected data legend is located below the graph, providing a color-coded key to identify the charted information.

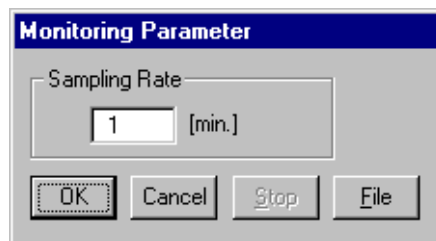
The Monitor pull-down menu allows you to begin monitoring another volume or exit the Monitoring window.

The Window menu lists the active monitoring windows and allows you to arrange the windows (cascade, tile or icon).

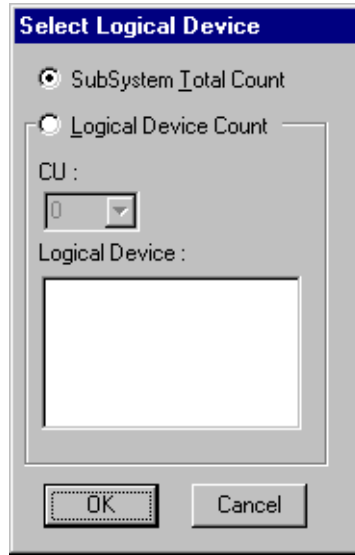
The Display menu allows you to display the graph with or without the graphical legend.

To view the CA I/O statistics:

1. Start Remote Control, connect to the desired disk array, and start the CA software.
2. In the HP Continuous Access main control window, click **Usage...** to open the Remote Copy Monitoring window.
3. In the Remote Copy Monitoring window, click the Monitor menu, and then click Start. The Monitoring Parameter window opens.



4. In the Monitoring Parameter window, enter the desired disk array data sampling rate (from one minute to 546 minutes in one-minute increments), and then click **OK**. The Select Logical Device window now opens.



5. In the Select Logical Device window, click Disk Array Total Count to display I/O statistics for all LDEVs in the connected disk array, or click **Logical Device Count** and then select the desired CU image and LDEV(s). When you are finished selecting LDEVs, click OK.

The Select Monitoring Data window opens.

Select Monitoring Data

Monitoring Data

RIO count

- ☐ All RIO count(A)
- ☐ All read count(B)
- ☐ All write count(C)

Initial Copy

- ☐ Initial Copy RIO count(D)
- ☐ Initial Copy Hit count(E)
- ☐ Average Transfer Rate[KB/S](F)
- ☐ Average Response[ms](G)

Migration Copy

- ☐ Migration Copy RIO count(F)
- ☐ Migration Copy Hit count(G)

Update Copy

- ☐ Update Copy RIO count(H)
- ☐ Update Copy Hit count(I)
- ☐ Average Transfer Rate[KB/S](M)
- ☐ Average Response[ms](N)

Restore Copy

- ☐ Restore Copy RIO count(J)
- ☐ Restore Copy Hit count(K)

Async. Copy

- ☐ Async RIO count(N)
- ☐ Total Number of Recordset(P)
- ☐ RCU Command Retries(Q)
- ☐ MCU Command Retries(R)
- ☐ Average Transfer Rate[KB/S](T)
- ☐ Average RIO Response[ms](U)

Synchronization

- ☐ Pair Synchronized[%(V)]
- ☐ Out of Sync Tracks(W)

OK Cancel

6. In the Select Monitoring Data window, select the I/O statistics you want to view, and then click OK. Refer to [Table 10](#) for a description of the I/O statistics.
7. The Remote Copy Monitoring window now opens and displays the selected I/O statistics for the selected LDEV(s). To open additional monitoring windows for additional LDEVs, repeat the preceding steps.

Table 10. Monitoring window I/O statistics

Statistic	Description
RIO count	
All RIO count	Total number of remote I/Os.
All read count	Total number of remote read I/Os.
All write count	Total number of remote write I/Os.
Initial copy	
Initial copy RIO count	Number of initial copy remote I/Os.
Initial copy hit count	Number of initial copy hits.
Migration Copy	
Migration copy RIO count	Number of migration copy remote I/Os.
Migration copy hit count	Number of migration copy hits.
Update copy	
Update copy RIO count	Number of update copy remote I/Os.
Update copy hit count	Number of update copy hits.
Restore Copy	
Restore copy RIO count	Number of restore copy remote I/Os.
Restore copy hit count	Number of restore copy hits.
Asynchronous copy	
Asynchronous RIO count	Number of asynchronous update copy remote I/Os.
Total number of recordsets	Number of asynchronous recordsets.
RCU command retries	Number of command retries due to RCU channel-command-retry messages.

MCU command retries	Number of command retries due to MCU status-change-pending (SCP) messages.
Average transfer rate (kB/s)	Average transfer rate (kB/sec) for CA/BC Async to update copy remote I/Os.
Average RIO response (ms)	(Total RIO process time on a disk array or selected volume for a certain interval period) / (Asynchronous RIO count); where RIO process time = time between the async data transfer request and the actual transfer of the recordset(s) to the RCU.
Synchronization	
Pair Synchronized (%)	Percent completion of initial copy operations (that is, number of synchronized pairs / total number of pairs).
Out of Sync Tracks	Number of tracks that have not yet been copied by the initial copy or resync copy operation (this applies only when suspended during initial copy or during resync copy).

Migration Copy and Restore Copy apply only to internal use. All other RIO statistics include both CA and BC remote copy operations (for example, async RIO count = Async-CA RIOs + BC RIOs).

If you want to select Average transfer rate, Average RIO response, or Pair Synchronized, you cannot select any other statistics at the same time.

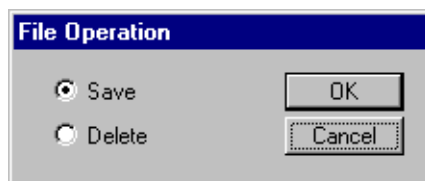
Saving and deleting remote copy I/O statistics

Remote copy I/O statistics are stored on the disk array during remote copy monitoring. The File Operation window allows you to save this data onto floppy diskette(s), or delete it. To open the File Operation window, click **File** in the Monitoring Parameter window.

This function is used by developers to analyze the performance of remote copy operations and is not generally intended for customer use.

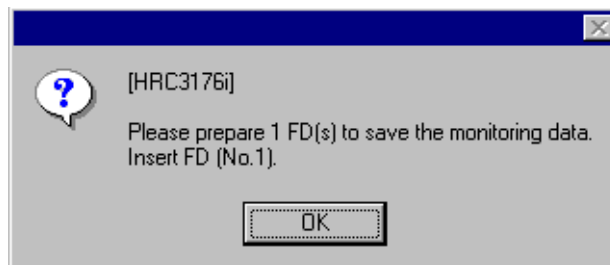
To save remote copy I/O statistics to floppy diskette(s):

1. Start Remote Control, connect to the desired disk array, and start CA.
2. In the main control window, click **Usage...** to open the Monitoring Parameter window.
3. In the Monitoring Parameter window, click **File** to open the File Operation window.



4. In the File Operation window, click **Save**, and then click **OK**.

A message states how many floppy diskettes are required and prompts you to insert the first DOS-formatted diskette into the floppy drive.

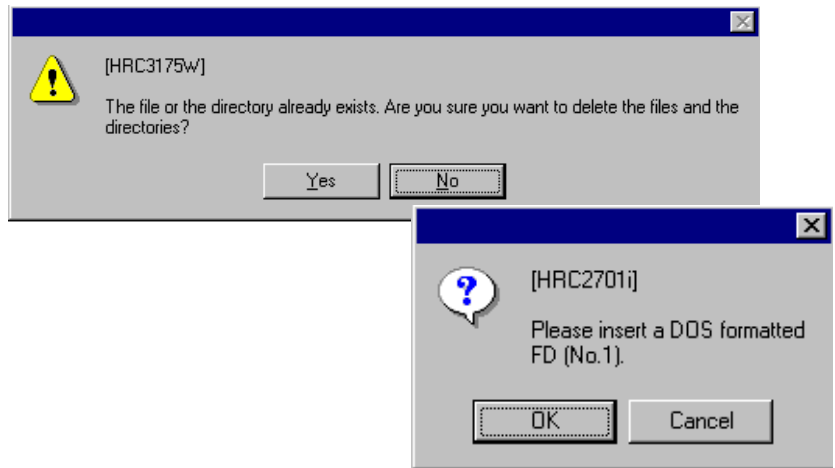


5. Insert the diskette into the drive, and click **OK**.

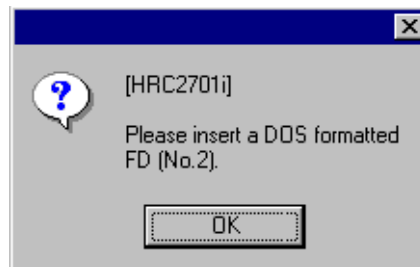
If the diskette contains data or directories, a confirmation message is displayed.

To delete the existing data or directories, click **Yes**.

To retain the existing data or directories, click **No**. A message prompts you to insert a different floppy diskette. Click **OK** to continue or **Cancel** to stop the operation.



6. The system starts saving the I/O statistics to floppy. If multiple floppy diskettes are required, a message prompts you to insert additional diskettes. Insert the additional diskette(s), and click **OK**.



7. Repeat the previous steps until all I/O statistics have been copied to floppy diskette.

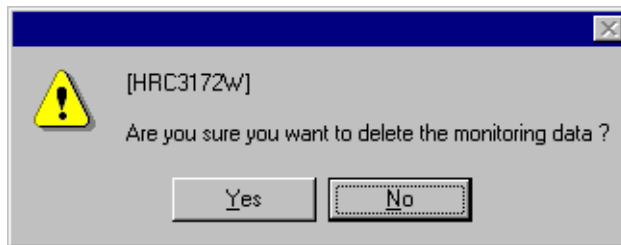
8. Remove the last floppy diskette when prompted. Then click **OK** to return to the File Operation window.



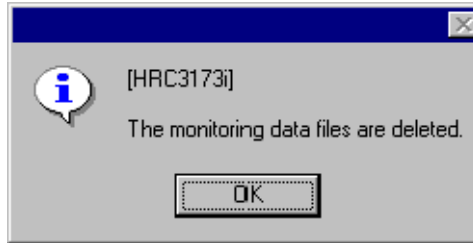
9. In the File Operation window, click **Cancel** to exit the window.

To delete remote copy I/O statistics from the disk array:

1. Start Remote Control, connect to the desired disk array, and start CA.
2. In the main control window, click **Usage...** to open the Monitoring Parameter window.
3. In the Monitoring Parameter window, click **File** to open the File Operation window.
4. In the File Operation window, click **Delete** and click **OK** to delete the I/O statistics.
5. A confirmation message asks if you want to delete the data. Click **Yes** to delete the data or **No** to retain it.



6. A message informs you that the data deletion is complete. Click **OK** to return to the File Operation window.



7. In the File Operation window, click **Cancel** to exit the window.

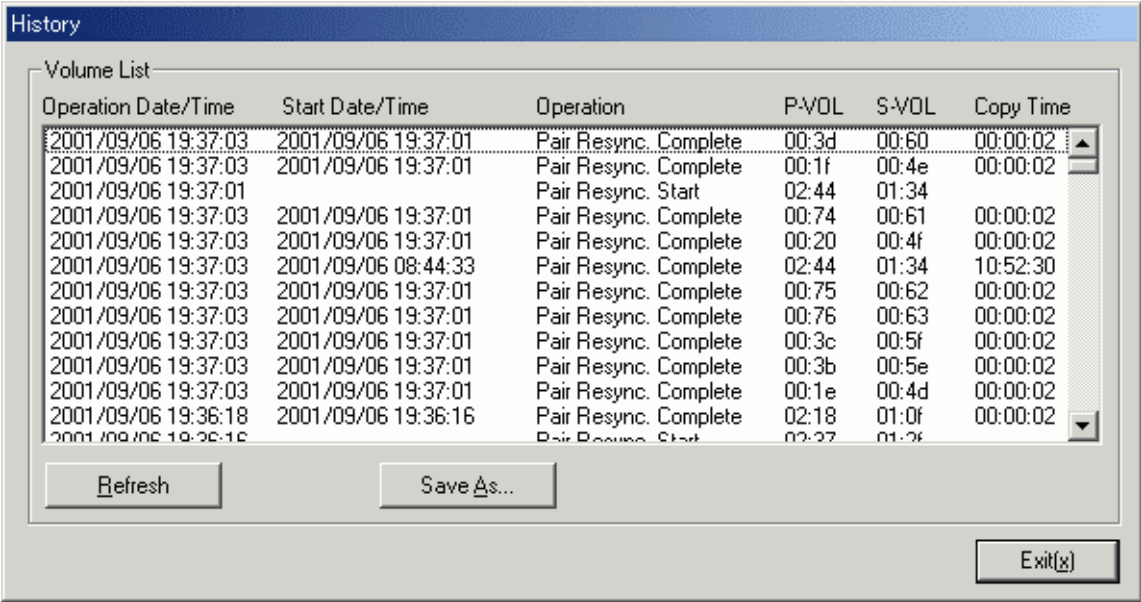
Viewing and saving CA history

The History window displays the history of remote copy operations on the connected disk array and allows you to save the history to a file in comma-separated values (CSV) format. To open the History window, click **History...** in the HP Continuous Access main control window.

CA history is saved for seven days and then automatically deleted. The History window displays the most recent operations up to 32,000 maximum. The history file contains the most recent operations up to 65,533 maximum. If the maximums are reached, the oldest operations are automatically deleted to keep the operation count below the maximum.

Caution

The user is responsible for saving CA history as needed before the information is automatically deleted. History information that has been deleted cannot be recovered. CA history is managed and stored separately from BC history.

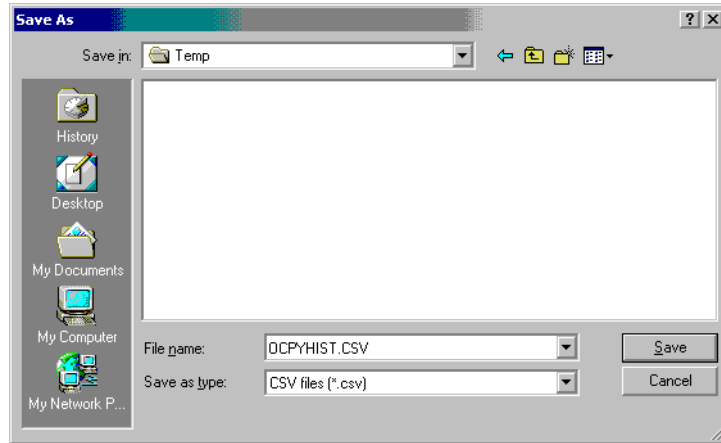


The History window displays the following buttons and data:

- **Operation Date/Time:** The date and time when the operation was completed.
- **Start Date/Time:** The date and time when the operation was started.
- **Operation:**
 - Pairing Start:** Paircreate operation was started.
 - Pairing Complete:** Paircreate operation was completed.
 - Pair Delete:** The pair was deleted.
 - Suspend Operation:** Pair suspending operation was performed.
 - Pair Suspend (Failure):** The pair was suspended because of a failure.
 - Pair Resync Start:** Pairresync operation was started.
 - Pair Resync Complete:** Pairresync operation was completed.
- **P-VOL:** CU number and LDEV number of the P-VOL.
- **S-VOL:** CU number and LDEV number of the S-VOL.
- **Copy Time:** The time taken for the operation from the start of the operation to the end. Displayed only for "Pairing Complete" and "Pair Resync Complete" operations.
- **Refresh:** Allows you to update the history information. The Refresh window shows that the history file is being updated on the SVP. The File Transfer window shows that the new file is being transferred to the remote console PC. The File Transfer window closes when the update operation is complete.
- **Save As...:** Allows you to save the history file on the remote console PC in CSV format.

To save the CA history to a file:

1. In the main control panel, click **History...** to open the History panel.
2. Click **Save As...** to open the Save As window. The default location is the temporary directory of the operating system, and the default file name is OCPYHIST.csv (OCPYHIST stands for "open copy history").



3. Select a location for the history file, change the file name if necessary, and click **Save**. If you select an unavailable directory, such as the remote copy installation directory, or if the directory does not have sufficient space for the file, an error message is displayed.

To cancel the save operation, click **Cancel**.

4. Use a spreadsheet program or text editor to open and view the history file. See the history file examples that follow.

When a very large number of pairs is created at once, the failure suspension of many pairs may occur. In this situation, the log information cannot be acquired, and the history information may not be displayed completely. See History File, Example 3 on page 155.

History file examples

The following figures show examples of the history file opened using a Microsoft® Excel spreadsheet. The first row displays the newest history information, and the following rows are in chronological order. The order of the rows in the file is the same as the order shown in the History window. [Table 11](#) describes each column of the history display.

Table 11. History File Data

Column	Description
A	Date and time of operation: year/month/day hour:minute:second.
B	Operation: Pairing Start, Pairing Complete, Pair Delete, Suspend Operation, Pair Suspend (Failure), Pair Resync. Start, or Pair Resync. Complete.
C	P-VOL: CU number : LDEV number.
D	RCU serial number. Note: For this version, the RCU serial number is not displayed, and column D displays “-----”.
E	S-VOL: CU number : LDEV number.
F	Time taken for the copy operation. Displayed only for the “Pair Complete” and “Pair Resync. Complete” operations.

History file example 1: Row 4 shows the start of a paircreate operation, and row 2 shows the completion of this paircreate operation and the time taken for the operation (02:10:30 in column F), which is calculated from the start time (10:10:10) and end time (12:20:40). Row 3 shows the start of a different paircreate operation, and row 1 shows the completion of and time taken for that paircreate operation.

	A	B	C	D	E	F	G
1	2001/09/03 10:10:20	Pairing Complete	00:01	-----	01:01	144:00:00	
2	2001/08/28 12:20:40	Pairing Complete	00:00	-----	01:00	02:10:30	
3	2001/08/28 10:10:20	Pairing Start	00:01	-----	01:01		
4	2001/08/28 10:10:10	Pairing Start	00:00	-----	01:00		
5							
6							

History file example 2: This example shows a case of Pair Suspend (Failure). For the paircreate operation started on row 6, the pair was suspended twice due to failure (rows 5 and 3) and resumed twice (rows 4 and 2). The time displayed in row 1 (column F) indicates the time for the pairresync operation started on row 2 (calculated from row 2 and row 1), not the total time (from row 6 to row 1) of the paircreate process.

	A	B	C	D	E	F
1	2001/08/28 12:25:50	Pair Resync.Complete	00:00	-----	0F:00	02:15:25
2	2001/08/28 10:10:35	Pair Resync.Start	00:00	-----	0F:00	
3	2001/08/28 10:10:30	Pair Suspend(Failure)	00:00	-----	0F:00	
4	2001/08/28 10:10:25	Pair Resync.Start	00:00	-----	0F:00	
5	2001/08/28 10:10:20	Pair Suspend(Failure)	00:00	-----	0F:00	
6	2001/08/28 10:10:10	Pairing Start	00:00	-----	0F:00	

History file example 3: This example shows a case of Pair Suspend (Failure) in which the log information could not be acquired because of a failure. Row 3 shows that the paircreate operation started, and row 2 shows that the pair was suspended due to failure. Because the log information for the start of the pairresync operation could not be acquired, the time taken for the pairresync operation could not be calculated. When this occurs, "--:--:--" is displayed in column F.

	A	B	C	D	E	F
1	2001/08/28 12:25:50	Pair Complete	00:00	-----	0F:C0	--:--:--
2	2001/08/28 10:10:20	Pair Suspend(Failure)	00:00	-----	0F:C0	.
3	2001/08/28 10:10:10	Pairing Start	00:00	-----	0F:C0	.
4						
5						
6						

Powering off/on CA components

The following sections provide instructions for performing planned outages of CA components. If you need to power off the disk array, call HP for assistance.

If power is removed from an MCU while CA operations are in progress, the CA pairs are not affected, but the update sequence consistency of the Async-CA groups at the RCU may be affected. When power is restored to an MCU, the MCU communicates with its RCU(s) to confirm the pair status of the S-VOLs. Make sure that CA communications are fully restored (all paths have normal status) before beginning I/O operations to the P-VOLs. If the MCU accepts a write I/O operation for a P-VOL before this confirmation is complete, the MCU suspends the pair and changes the status of the P-VOL to *suspended-by RCU* (the MCU cannot change S-VOL pair status).

If power is removed from an RCU or remote copy connection while CA operations are in progress, the MCU(s) detects the communication failure, suspends all affected pairs, and generates SIMs reporting the failures. The MCU changes the status of the P-VOLs to *suspended-by RCU* but cannot change the status of the S-VOLs.

If an MCU/RCU is powered off and its backup batteries are fully discharged while CA pairs are suspended, the P-VOL/S-VOL cylinder maps will not be retained. In this unlikely case, the MCU/RCU marks all cylinders of all suspended CA volumes as modified, so that the MCU will perform the equivalent of an entire initial copy operation when the pairs are resumed. (The S-VOL cylinder map is used for Async-CA operations and for the CA S-VOL write enable option.)

Planned outage of the MCU

A planned MCU outage does not affect Sync-CA. For Async-CA operations, the MCU must communicate with the RCU even when there are no P-VOL update I/Os from the primary system. During the power-off sequence, the MCU will automatically suspend all Async-CA pairs in the PAIR and COPY states (suspend type = MCU P/S-OFF). During the power-on-reset sequence, the MCU will automatically resume these suspended pairs (pairs with other suspend types are not automatically resumed).

Planned outage of the RCU or remote copy connection

You must split all affected CA pairs prior to a planned outage of an RCU or of a remote copy connection component (such as an ESCON director or channel extender). If you do not split the pairs first, the MCU(s) will detect the communication failure, suspend all affected pairs, and generate SIMs reporting the failures. To perform a planned outage of a CA RCU or remote copy connection component:

1. Identify all CA P-VOLs that will be affected by the equipment outage. You need to know the MCU, CU image, and ID (port, TID, LUN) for each of these P-VOLs.

For RCU power-off, identify all P-VOLs which are paired with S-VOLs in the RCU to be powered off.

For remote copy connection outage, identify all P-VOLs in all MCUs which use the path/component to be powered off.

2. Connect to each MCU which contains affected P-VOLs, and split all affected CA pairs. Make sure to confirm the pair status changes (HP Continuous Access main control or Pairedisplay window).
3. Perform the planned outage of the RCU or remote copy connection.
4. When the RCU is fully powered on and ready to resume operations, resume (pairresync) all CA pairs at each MCU. Make sure to confirm the pair status changes.

Planned outage of the MCU and RCU

When you plan an outage of CA MCUs and RCUs at the same time, the MCUs must be powered off before the RCUs and powered on after the RCUs. To perform a planned outage of a CA MCU and RCU:

1. If RCU power-on will be difficult to control (Power-Control-Interface setting), consider increasing or disabling the RCU ready timeout group option for each Async-CA group with S-VOLs in the RCU(s) to be powered off.
2. Perform the planned outage of the MCU(s). Do not power-on the MCU(s) yet.
3. If an RCU to be powered off is connected to an MCU which is not powered off, make sure to split those CA pairs before powering off the RCU.
4. Perform the planned outage of the RCU(s).
5. Power on the RCU(s). Make sure that they are fully operational and ready to resume operations before powering on the MCUs.
6. Power on the MCU(s), and make sure that they are ready to resume operations. If you split any pairs, you can also resume (pairresync) those pairs now.

Discontinuing CA operations

When you are ready to discontinue CA operations, you need to do so properly, performing certain operations in the correct order to prevent errors. For example, CA will not allow you to delete an RCU path until you have deleted all CA pairs still using that path. Also, you cannot delete a group until you have deleted all Async-CA pairs in that group.

To discontinue all CA operations:

1. First delete all CA pairs from the MCU(s) (pairsplit-S). For Async-CA pairs, you can use the Delete Range-Group option to delete all pairs in a group using just one operation. Verify that the pair status has changed to SMPL for all CA volumes before continuing.
2. Delete the Async-CA group(s) from the MCU(s). The RCU will automatically delete a group when all pairs in the group have been deleted.
3. Delete the RCUs. Check each CU image of each MCU to make sure that all RCUs have been deleted before continuing.
4. Remove the remote copy connections (physical paths). If you are not familiar with the operation of the remote copy hardware components (ESCON directors, repeaters, and switches), call HP for assistance.
5. For ESCON, reset the RCP(s) to LCP(s) at the MCU(s). For Fibre Channel interface, reset the initiator port(s) to ordinary target(s) at the MCU(s).

This completes the CA shut down and discontinuation procedure.

Disaster recovery

This chapter describes CA operations for recovering from a primary site failure:

- Preparing for disaster recovery
- Switching operations to the remote site (when a failure occurs)
- Transferring operations back to the primary site
- Resuming normal operations at the primary site (after recovery)

Preparing for disaster recovery

The type of disaster and the status of the CA volume pairs determines the best approach for disaster recovery. For example, if all CA volume pairs are in the pair status when a total system failure occurs at a single point in time, the S-VOLs are current and recovery is straightforward. Unfortunately, some disasters are not so “orderly” and involve intermittent or gradual failures occurring over a longer period of time. You should anticipate and plan for all types of failures and disasters.

The major steps in preparing for disaster recovery are:

6. establish CA operations for the volumes and groups identified. Make sure to select the proper CU images to access the desired volumes.
7. Use the appropriate combination of CA options for disaster recovery:

Async-CA offloading timer option and copy pending timeout group option. The copy pending timeout group option can be used to limit the time duration when updates may be lost.

The offloading timer value should be set lower than the HBA timeout value.

When channel-extenders are used for Async-CA, the offloading timer should be set to 35 seconds or less to avoid affecting host I/O performance.

Async-CA Error Level pair option, and Sync-CA P-VOL Fence Level pair option.

8. Establish file and database recovery procedures. These procedures should already be established for recovering volumes that become inaccessible due to control unit failure.
9. Make sure that the host system at the primary site is configured to receive sense information from the disk array MCUs (for example, via CCI or SNMP).
10. Install and configure host failover software between the main and remote sites. Host failover capability is essential if you use the P-VOL fence level setting of S-VOL Status or Never for any CA volume pairs.

Considering the P-VOL fence-level setting

The P-VOL fence level setting for each Sync-CA volume pair determines whether the P-VOL will be fenced when CA remote copy operations fail. [Table 12](#) summarizes the effect of the fence level setting on a Sync-CA P-VOL.

The P-VOL fence level settings of “Data,” “Status,” and “Never” do not apply to Async-CA pairs, which have a special CCI fence level of “Async.” Async-CA P-VOLs are never fenced due to suspension of the pair.

Table 12. Effect of the fence level setting on a CA P-VOL

Type of Failure		Fence Level Setting		
		Fence Level Data	Fence Level Status	Never
The update copy operation failed, and the MCU was able to change the status of the S-VOL to PSUE.	Write I/O operations to the P-VOL will be:	Rejected	Accepted	Accepted
The update copy operation failed, and the MCU was NOT able to change the status of the S-VOL to PSUE.	Write I/O operations to the P-VOL will be:	Rejected	Rejected	Accepted

Data

When fence level **Data** is selected, the P-VOL will be fenced if an update copy operation fails. This P-VOL fence level setting ensures that the S-VOL remains identical to the P-VOL once the CA volume pair is synchronized, but makes the P-VOL inaccessible for updates whenever CA remote copy operations fail. This setting should be considered for the most critical volumes for disaster recovery because it will reduce the amount of time required to analyze the currency of the S-VOL during disaster recovery efforts. This setting is also designed for applications that can continue to operate with another device pair.

You must stop host I/Os before suspending Sync-CA pairs with the Data fence level when the following conditions exist: Sync-CA and Async-CA pairs exist in the same disk array, and there are host I/Os to the Async-CA pairs. If you do not stop host I/Os, the pairs might be forcibly suspended because of a time-out error, and host I/Os will be rejected.

Status

When fence level Status is selected, the P-VOL is fenced only if the MCU is not able to change the S-VOL pair status to PSUE. If the MCU successfully changes the S-VOL pair status to PSUE, subsequent write I/O operations to the P-VOL will be accepted, and the MCU will keep track of updates to the P-VOL. This allows the volume pair to be resumed quickly using the pairresync operation (out-of-sync-cylinders only). This setting will also reduce the amount of time required to analyze the S-VOL currency during disaster recovery.

Never

When Never is selected, the P-VOL is never fenced while the pair is suspended. This P-VOL fence level setting ensures that the P-VOL remains available to applications for updates, even if all CA copy operations have failed. The S-VOL may no longer be in sync with the P-VOL, but the MCU will keep track of updates to the P-VOL while the pair is suspended. Host failover capability is essential if this fence level setting is used. For disaster recovery, the currency of the S-VOL is determined by using the sense information transferred via host failover or by comparing the S-VOL contents with other files confirmed to be current.

Setting the fence level

When a takeover by the S-VOL occurs as shown in [Figure 24](#) (two errors have already occurred), Data(V) remains in the rollback process at the secondary host, and full recovery cannot be performed. To prevent this, you can define the fence level of the Redo log file as Data, so that the P-VOL returns an error if a data disagreement occurs concerning a write request from the host. The Data fence-level setting maintains full consistency between the Redo log file and the data file because the write error at the log file prevents data being written to the data file.

When the fence level is defined as Data, a write I/O causes an error even when processing has been suspended because of an error at the S-VOL. In this case, a takeover by the S-VOL occurs, and the advantage of the duplex system is lost. Therefore, if you define the fence level as Data, applications must be able to handle write I/O errors. Systems that allow disk errors by means of multiplication can function with the Data fence-level setting.

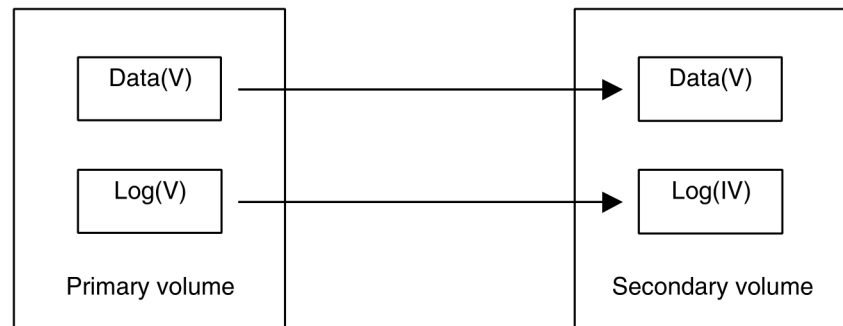


Figure 24. Relationship between log file and data file in PAIR status

Since most UNIX file systems (excluding JFS and VxFS) have no journal files, the P-VOL fence level should be defined as Never. When a takeover by the S-VOL occurs, fsck is executed on the volume and the file system is cleaned up, even if the S-VOL is undefined at the secondary host. The data that will be lost depends on how much differential data is contained in the P-VOL when the S-VOL is suspended. During operation, error recovery should be performed when the suspended status (PSUE) is detected.

Transferring sense information between sites

When the MCU (or RCU for Async-CA) suspends a CA pair due to an error condition, the MCU/RCU sends sense information with unit check status to the appropriate host(s). This sense information is used during disaster recovery to determine the currency of the S-VOL, and must be transferred to the remote site via the host failover software.

File and database recovery procedures

When a Sync-CA pair is suspended or when the MCU fails because of a disaster, the S-VOL may contain in-process data. A data set could be open, or transactions may not have completed. Even if you use the fence level Data for all Sync-CA pairs, you need to establish file recovery procedures. These procedures should be the same as those used for recovering any volume which becomes inaccessible due to control unit failure. These procedures are more important if the fence level Status or fence level Never settings are used.

Async-CA does not provide any procedure for detecting and retrieving lost updates. To detect and recreate lost updates, you must check other current information, such as the database journal log file that was active at the primary system when the disaster occurred. The Async-CA group consistency time (C/T) (MCU SVP time) can be useful when performing this detection and retrieval. Since this detection/retrieval process can take a while, your disaster recovery scenario should be designed so that detection/retrieval of lost updates is performed after the application has been started at the secondary system.

You should prepare for file and database recovery by:

- Using files such as database log files for file recovery
- Using the fence level Data setting for CA pairs containing log files
- Using the sense information transferred via host failover

Switching operations to the remote site

If a failure occurs at the primary site, the first disaster recovery activity is to switch your operations to the secondary site. The Sync-CA S-VOLs are recovered individually based on the pair status and P-VOL fence level information for each pair. The Async-CA S-VOLs are recovered based on pair status and consistency status at the RCU.

The procedure for switching operations to the remote backup site are:

1. Analyze the currency of the Sync-CA S-VOLs and the consistency of the Async-CA S-VOLs.
2. Record the consistency time (C/T) of each Async-CA group. The suspended Async-CA S-VOLs with consistency status of *group* will indicate the same C/T. The consistency status and consistency time are displayed only at the RCU.
3. Perform file recovery as needed.
4. At the remote site, connect to each RCU, and delete all Sync-CA pairs. For Async-CA pairs, delete all consistent pairs in a group at the same time using the pairsplit-S command with the C/T delete range option. This option prevents you from accidentally using inconsistent pairs for disaster recovery.

Caution *Once an S-VOL changes to simplex (SMPL), you cannot distinguish it from a non-CA simplex volume. The Async-CA C/T is also discarded when the pair is deleted.*

5. If necessary, use the logical volume manager to change the volume labels of the S-VOLs.
6. Make sure that all required file recovery procedures have been completed before bringing the S-VOLs online.
7. At this point you may start critical applications at the remote site with the previous S-VOLs taking the place of their P-VOLs.

Analyzing the currency of Sync-CA S-VOLs

Table 13 shows how to determine the currency of a Sync-CA S-VOL based on its pair status and P-VOL fence level setting. For Sync-CA pairs with a P-VOL fence level setting of **Never**, further analysis will be required to determine the currency of these S-VOLs. The currency of these S-VOLs can be determined by using the sense information transferred via the host failover, or by comparing the contents of the S-VOL with other files which are confirmed to be current (such as database log files). These S-VOLs should be recovered using the files which are confirmed to be current.

Actual data recovery must be done using recovery point data in the database redo log.

Table 13. Analyzing the currency of Sync-CA S-VOLs

Status of S-VOL	Fence Level	Currency of S-VOL
SMPL	Data Status Never	Inconsistent. This S-VOL does not belong to a CA volume pair. (<i>Note:</i> Even if you established a CA pair for this volume, you must regard this volume as inconsistent.)
COPY	Data Status Never	Inconsistent. This S-VOL is not synchronized because not all cylinders have been copied from the P-VOL yet. This S-VOL must be initialized (or copied from the P-VOL at a later time).
PAIR	Data Status	Current. This S-VOL is synchronized with its P-VOL.
	Never	Needs to be analyzed. This S-VOL requires further analysis to determine its level of currency.
PSUE - initial copy failed	Data Status Never	Inconsistent. This S-VOL is not synchronized because not all cylinders have been copied from the P-VOL yet. This S-VOL must be initialized (or copied from the P-VOL at a later time).
PSUS - S-VOL by operator	Data Status Never	Suspect. This S-VOL is not synchronized with its P-VOL if any write I/Os were issued to the P-VOL after the pair was split. This pair should be restarted using the Entire Volume initial copy option, but the None option can be used if you are sure that no data on the P-VOL changed.

PSUS/PSUE - all other types	Data	Current. This S-VOL is synchronized with its P-VOL.
	Status Never	Suspect. This S-VOL is not synchronized with its P-VOL if any write I/Os were issued to the P-VOL after the pair was split or suspended. Restore the consistency of this S-VOL and update it, if required. The time of suspension indicated on the Pairdisplay window will help to determine the last time this S-VOL was updated.

Analyzing the consistency of Async-CA S-VOLs

Table 14 shows how to determine the consistency of a Async-CA S-VOL based on its pair status and consistency status. For Async-CA S-VOLs with a consistency status of LU, the volume is not consistent with other volumes in the same group, and further analysis will be required to determine the currency of each of these S-VOLs. The currency of these S-VOLs can be determined by using the sense information transferred via host failover software or by comparing the contents of the S-VOL with other files that are confirmed to be current (such as database log files). These S-VOLs should be recovered using the files that are confirmed to be current.

Actual data recovery must be done using recovery point data in the database redo log.

Table 14. Analyzing the consistency of Async-CA S-VOLs

Status of S-VOL	Usable for Recovery?	Description
PAIR	No	These states do not usually occur during Async-CA disaster recovery, because the RCU suspends all Async-CA S-VOLs when communication with the MCU is lost. Async-CA S-VOLs in these states should not be used for disaster recovery. Simplex volumes cannot be distinguished from S-VOLs which have already been deleted by the pairsplit-S operation.
COPY	No	
SMPL	No	
PSUE-Group	Yes	<p>The update sequence consistency across these S-VOLs is ensured at the point in time indicated by the consistency time. These S-VOLs can be used for disaster recovery at the secondary system.</p> <p>Updates which were performed at the primary system after the indicated consistency time were probably lost.</p>
PSUE-LU	No	<p>The contents of this S-VOL may be behind the other S-VOLs in the consistency group. If this volume must be consistent with the other volumes in the same group, this S-VOL should not be used for disaster recovery.</p> <p>The cause for this status is the Async-CA Error Level pair option for this pair is LU (not Group), and this pair was suspended before the disaster/failure, at the beginning of the rolling disaster, or during the initial copy operation.</p>
PSUS	Uncertain	The S-VOL is not synchronized with the P-VOL if write I/Os were issued to the P-VOL after the pair was split or suspended. The time of suspension indicated on the Pairdisplay window will help determine the last time the P-VOL was updated. The data on the S-VOL is onsistent and can be used as a point-in-time copy of the P-VOL.

Transferring operations back to the primary site

Once the applications are running at the secondary (remote) site, the next activity is to restore the primary (main) site and transfer operations back to the primary site. To transfer operations to the primary site:

1. Bring up the host server(s) at the primary site, and make sure that all CA components are fully operational.
2. At the primary site, delete all CA pairs at the MCUs. The Delete Pair by Force option must be used because the previous S-VOLs are in the SMPL status at the secondary site.
3. At the main site, delete all Async-CA consistency groups at the MCUs.
4. At the main site, delete the RCUs. Remember to connect with each MCU and each CU image to make sure that all RCUs have been deleted.
5. At the main site, configure the MCU ports as needed. If you plan to use the same remote copy connections to copy back, change the existing RCPs to LCPs, or change the existing initiator ports to ordinary target ports.
6. If you plan to use the same channel extenders, change the operating mode to the opposite direction. The boxes/nodes connected to the MCUs must be set to channel-mode, and the boxes/nodes connected to the RCUs must be set to device-mode.
7. At the remote site, configure the appropriate ports to enable CA operations in the reverse direction (change LCPs to RCPs for ESCON, change target ports to initiator ports for fibre). This enables the original RCUs to send CA remote copy operations to the original MCUs to bring the original P-VOLs up to date.
8. At the remote site, establish the same Async-CA groups and CA pairs in the reverse direction to synchronize the original P-VOLs with the S-VOLs. Make sure to use the Entire Volume initial copy option.

Resuming normal operations at the primary site

Once the CA pairs have been established in the reverse direction, you are ready to resume normal operations at the primary (main) site. Remember that the CA terminology is now reversed: the original RCUs and S-VOLs (secondary site) are now the MCUs and P-VOLs, and the original MCUs and P-VOLs (primary site) are now the RCUs and S-VOLs.

To resume normal operations at the primary site:

1. At the secondary site, make sure that all CA pairs are in the PAIR (duplex) status. This indicates that the CA initial copy operations are complete.
2. Halt the applications at the remote site, and take the P-VOLs (original S-VOLs) offline at the remote site. This maintains synchronization of the Sync-CA pairs.
3. Split (pairsplit-R) all CA pairs at the MCUs (original RCUs) to destage any pending data from cache. Confirm that the pairs are split (PSUS) before proceeding. If an error occurs, resolve it before proceeding.
4. Delete all CA pairs at the MCUs (original RCUs). You do not need to use the Delete Pair by Force option. For Async-CA pairs, the MCU and RCU complete all pending updates before changing the pair status to SMPL.
5. Change the CA settings at the MCUs (original RCUs) to prepare for normal CA operations. Delete the Async-CA groups and the RCUs (original MCUs). If you plan to use the same remote copy connections, reconfigure the ports (change RCPs back to LCPs for ESCON, change initiator ports back to ordinary target ports for fibre).
6. If you plan to use the same channel extenders, change the operating mode back to the original direction. The boxes/nodes connected to the MCUs must be set to channel-mode, and the boxes/nodes connected to the RCUs must be set to device-mode.
7. At the primary site, configure the RCPs or initiator ports, add the RCUs, and add the Async-CA groups.

8. At the primary site, establish all CA groups and pairs in the original direction. You may use the None initial copy option because all P-VOLs and S-VOLs are synchronized. If there is any possibility that the volumes are not 100% synchronized, use the Entire Volume initial copy option to be safe.
9. Bring the MCU and P-VOLs online, and start the applications at the primary site.

Troubleshooting

This chapter provides general troubleshooting procedures and error codes.

Troubleshooting CA operations

Table 15 provides general troubleshooting instructions for CA.

Table 16 provides troubleshooting instructions for RCU paths.

Table 17 provides troubleshooting instructions for suspended Sync-CA and Async-CA pairs.

Table 18 provides troubleshooting instructions for Async-CA suspension conditions.

Table 15. General CA troubleshooting

Error	Corrective Action
The remote console PC hangs, or CA operations do not function properly.	<p>Make sure that the problem is not being caused by the PC or Ethernet hardware or software, and restart the PC. Restarting the remote console PC does not affect disk array operations.</p> <p>Make sure that all CA requirements and restrictions are met (for example, same LU type).</p> <p>Make sure that the MCU and RCU and remote copy connections are powered on and fully operational (NVS, cache).</p> <p>Check all input values and parameters to make sure that you entered the correct information on the remote console PC (for example, RCU S/N and SSID, path parameters, P-VOL and S-VOL IDs).</p> <p>Disconnect HP Performance Advisor from the disk array before connecting to the same disk array using Remote Control XP.</p>

An RCP or initiator channel-enable LED indicator (on the disk array control window) is off or flashing.	Please call the HP Support Center for assistance.
The volume pairs and/or RCUs are not displaying correctly.	Make sure that the correct CU image is selected.
A CA error message is displayed on the PC.	Resolve the error, and then try the CA operation again.
The RCU path status is not normal.	Check the path status (RCU Status window), and see Table 16 .
The pair status is <i>suspended</i> .	Check the pair status (Pairedisplay window), and see Table 17 .
Paircreate or pairresync operation resulted in a timeout error [HRC2019W].	<p>Hardware failure: If the timeout error was caused by a hardware failure, a SIM will be generated. If this occurs, call service personnel, and retry CA operations after the problem is fixed.</p> <p>Heavy workload: If no SIM was generated, wait for a while (5 or 6 minutes), then check the pair status of the pair(s) being created or resumed. If the pair status changed correctly, the failed operation completed after the timeout message was issued. If the pair status did not change as expected, heavy workload might have prevented the CA operation from being completed. In this case, retry the CA operation again when the disk array has a lighter workload.</p> <p>If a communication error between the RMC and SVP occurs, refer to the remote console documentation for instructions.</p>
There is a pinned track on a CA volume.	See “Troubleshooting” (page 175) for instructions.

Table 16. Troubleshooting RCU path status problems

Path Status	Description	Corrective Action
Initialization Failed	The link initialization procedure to the RCU failed.	<p>Make sure that you entered the correct RCU S/N and SSID and path parameters (port, link address, logical address).</p> <p>For ESCON, make sure that the correct MCU port is configured as an RCP. Make sure that the correct RCU port is configured as an LCP.</p> <p>For Fibre Channel interface, make sure that the correct MCU port is configured as an initiator port. Make sure the correct RCU port is configured as an RCU target port.</p>
Communication Time Out	Communication between the MCU and RCU timed out.	<p>Make sure that the RCU is powered on and fully functional (NVS and cache ON).</p> <p>Make sure that the remote copy connection hardware (cables, connectors, ESCDs, extender devices, communication lines, and all other devices connected to the extenders) are properly configured and functional.</p> <p>Delete the failed path. You may need to change the minimum paths setting or delete the RCU in order to delete the path. Then add the path/RCU using Edit Path or Add RCU.</p>

Resource Shortage (MCU/RCU)	The MCU/RCU rejected the establish logical path link control function because all logical path resources in the MCU/RCU are being used for other connections.	<p>Delete the failed path, and also delete all paths and RCUs not currently in use. The MCU can be connected to up to four RCUs with up to eight paths to each RCU.</p> <p>Make sure that all MCU and RCU ports are properly configured: ESCON – LCPs for hosts and MCUs, RCPs for RCUs; Fibre Channel – ordinary target ports or RCU target ports for hosts, RCU target ports for MCUs, initiator ports for RCUs.</p> <p>If necessary, connect to the RCU to delete paths/RCUs and reconfigure ports, then reconnect to the MCU.</p> <p>Add the path/RCU again using Edit Path or Add RCU.</p>
Serial Number Mismatch	The RCU's S/N does not match the specified S/N.	<p>Make sure that you entered the correct RCU S/N and SSID and path parameters (port, link address, logical address).</p> <p>Delete the failed path. You may need to change the minimum paths setting or delete the RCU in order to delete the path. Then add the path/RCU using Edit Path or Add RCU.</p>

Invalid Port	The specified port is not configured as an RCP or initiator port, or this path already exists.	<p>For ESCON, make sure that the correct MCU port is configured as an RCP. Make sure the correct RCU port is configured as an LCP.</p> <p>For Fibre Channel, make sure that the correct MCU port is configured as an initiator ports. Make sure that the correct RCU port is configured as an RCU target port.</p> <p>Make sure that you entered the correct RCU S/N and SSID and path parameters (port, link address, logical address).</p> <p>Delete the failed path. You may need to change the minimum paths setting or delete the RCU in order to delete the path. Then add the path/RCU using Edit Path or Add RCU.</p>
RCU Port Number Mismatch	The specified port in the RCU is physically disconnected from the MCU, or the port is not configured as an RCU target port.	<p>Make sure that you entered the correct RCU port number. Correct the port number if necessary.</p> <p>Make sure that the port in the RCU is configured as an RCU target port. Configure the port as an RCU target port if necessary.</p> <p>Make sure that the MCU and RCU are physically connected.</p>
<blank>	This path was not established.	Delete the failed path. You may need to change the minimum paths setting or delete the RCU in order to delete the path. Then add the path/RCU using Edit Path or Add RCU.

Table 17. Troubleshooting suspended CA pairs

Suspend Type	Applies to	Description	Corrective Action
PSUE, by RCU	P-VOL	The MCU detected an error condition at the RCU which caused the MCU to suspend the volume pair. The S-VOL suspend type is <i>by MCU</i> .	Clear the error condition at the RCU or S-VOL. If you need to access the S-VOL, split the pair (pairsplit-R) from the MCU using the S-VOL write enable option. Resume the pair (pairresync) from the MCU after the error condition is cleared.
PSUE, S-VOL Failure	P-VOL	The MCU detected an error during communication with the RCU or an I/O error during update copy. In this case, the suspend type for the S-VOL is usually <i>by MCU</i> .	<p>Check the path status on the RCU Status window.</p> <p>Clear any error conditions at the RCU or S-VOL. If you need to access the S-VOL, split the pair (pairsplit-R) from the MCU using the S-VOL write enable option.</p> <p>Resume the pair (pairresync) from the MCU after the error condition is cleared.</p>
PSUE, MCU IMPL	P-VOL, S-VOL	The MCU could not find valid control information in its nonvolatile memory during the IMPL procedure. This error occurs only if the MCU is without power for more than 48 hours (power failure and fully discharged batteries).	Resume the pair (pairresync) from the MCU. The MCU will perform an entire initial copy operation in response to the pairresync request.

PSUE, Initial Copy Failed	P-VOL, S-VOL	The MCU suspended this pair during the initial copy operation. The data on the S-VOL is not identical to the data on the P-VOL.	Delete the pair from the MCU. Clear all error conditions at the MCU, P-VOL, RCU, and S-VOL. Restart the initial copy operation using the Paircreate window.
PSUE, MCU P/S-OFF	S-VOL (Async)	The MCU suspended all Async-CA pairs due to MCU power-off.	None. The MCU will automatically resume these Async-CA pairs during power-on.
PSUS, Sidefile Overflow	P-VOL S-VOL	The amount of sidefile exceeds the specified current pending update data rate, and the RCU data is not transferred within the specified off-loading timer.	Add cache memory, increase the number of paths between MCU and RCU, or decrease the number of Async pairs or host I/Os.

Table 18 provides troubleshooting instructions for the Async-CA suspension conditions caused by the offloading timer async option, the group timeout options (copy pending and RCU ready), and recordset errors. Hardware failures which affect the cache storage/shared memory of the MCU or RCU may also cause the Async-CA volume pairs to be suspended.

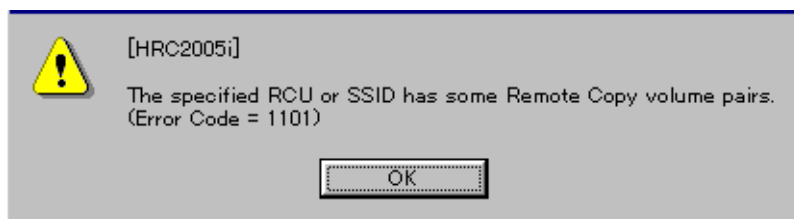
Table 18. Resolving Async-CA suspension conditions

Classification	Causes of Suspension	SIM	Recovery procedure
MCU/RCU hardware	<p>Hardware redundancy has been lost due to some blockade condition. As a result, MCU-RCU communication, creating or receiving recordset, or the staging or de-staging process could not complete.</p> <p>The pending recordset cannot be retained because one side of cache storage or shared memory has been blocked due to hardware failure.</p> <p>MCU-Creating/sending recordset failed due to unrecoverable hardware failure.</p> <p>RCU-Reading/settling recordset failed due to unrecoverable hardware failure.</p> <p>The drive parity group was in correction-access status while the CA pair was in COPY status.</p>	DB0x DB1x DB2x	<p>According to SIM, remove the hardware blockade or failure.</p> <p>Re-establish failed volume pairs (pairresync).</p>

MCU-RCU communication	<p>During the power-on-reset sequence, the MCU could not communicate with the RCU within the specified RCU ready timeout.</p> <p>The RCU could not settle the pending recordset or could not communicate with the MCU before the copy pending timeout due to MCU not-ready or inoperative facilities on the remote copy connections.</p>	<p>DB0x</p> <p>DB1x</p>	<p>Remove the failed condition at the RCU/MCU or on the remote copy connection.</p> <p>Re-establish failed pairs (pairresync).</p>
RIO overload	<p>The unrecoverable RIO (remote I/O) timeout occurred due to overload of the RCU or the communication facilities on the remote copy connections.</p> <p>No recordset could be sent within the specified copy pending timeout.</p> <p>The RCU could not settle the pending recordset before the copy pending timeout due to overload of the RIO or the RCU itself.</p>	DB1x	<p>Delete failed pairs (pairsplit-S).</p> <p>Reconsider the performance resources necessary, and increase resources as needed (cache amount, number of MCU-RCU paths, etc.).</p> <p>Re-establish failed pairs (paircreate).</p>
RIO failure	The RIO (remote I/O) could not complete due to the failure at the RCU.	DB2x	<p>According to SIM generated at the RCU, remove the failure.</p> <p>Re-establish failed pairs (pairresync).</p>
MCU planned outage	The Async-CA pairs were temporarily suspended due to a planned outage of the MCU.	DB8x	No recovery procedure is required. The MCU will automatically remove the suspension condition during the next power-on-reset sequence.

CA error codes

The CA software displays error messages on the remote console PC when error conditions occur during CA operations. The error message describes the error and provides a four-digit error code (**Error Code = 1101**). The first two digits of the error code indicate the error type, and the last two digits provide more specific information about the error. The error message may also include a disk array SVP error code (**[HRC2005i]**). If you need to call the HP Support Center for assistance, please report the CA and SVP error codes.



Delete RCU failed because the RCU still contains one or more pairs with the current MCU.

Service information messages (SIMs)

The disk array generates a SIM when it is necessary to notify the user of a possible service requirement for the disk array. SIMs can be generated by the channel and storage path microprocessors of the disk array and by the service processor (SVP) of the disk array. The SVP reports all SIMs related to CA operations. Each time a SIM is generated, the amber **Message** LED in the disk array front operator's window (under the **Ready** and **Alarm** LEDs) turns on as an additional alert for the user.

The SIMs are classified according to severity for reporting and logging purposes: service, moderate, serious, or acute. All SIMs are logged on the disk array SVP and reported to the remote console PC (Remote Control R-SIM window). During CA operations, the MCU and RCU generate a service SIM each time the pair status of the P-VOL or S-VOL changes for any reason, including normal status transitions (for example, COPY to PAIR). SIMs generated by the MCU will include the P-VOL device ID (byte 13), and SIMs generated by the RCU will include the S-VOL device

ID (byte 13). For further information on the disk array SIMs, please refer to the disk array documentation, or call the HP Support Center for assistance.

If SNMP is installed and operational for the disk array, each SIM will result in an SNMP trap being sent to the appropriate host(s). For further information on SNMP operations, please refer to the disk array documentation, or contact your HP account team.

Calling the HP Support Center

If you need to call the HP Support Center, make sure to provide as much information about the problem as possible, including:

- The Remote Console configuration information saved on diskette using the **FDCOPY** function
- The circumstances surrounding the error or failure
- The exact content of any error messages displayed on the host system(s)
- The CA (or other) error code(s) displayed on the remote console PC
- The remote service information messages (R-SIMs) logged on the remote console PC and the reference codes and severity levels of the recent R-SIMs

Please refer to the disk array documentation for additional troubleshooting information for the Remote Control software and the remote console PC.

Pinned track recovery

If a pinned track occurs on a CA P-VOL or S-VOL, the MCU will suspend the pair (SIM reference code = DB1x). Use the following procedure to ensure full data integrity of the volume pair while recovering the pinned track:

1. Connect to the MCU of the suspended pair, and select the correct CU image.
2. Delete the CA pair (pairsplit-S) which contains the volume with the pinned track.
3. If the volume is offline (for example, S-VOL has pinned track), bring the volume online.
4. Perform your usual procedure for recovering data from a pinned track. Refer to the pinned track recovery procedures for your operating system, or contact your HP representative for assistance in recovering the pinned track.
5. If the volume was previously offline (for example, S-VOL), make sure to take the volume offline again.
6. Recreate the volume pair using the Paircreate window, and make sure to use the Entire Volume initial copy option.

Glossary

AL	Arbitrated loop.																								
AL-PA	Arbitrated loop physical address.																								
BC	HP StorageWorks Business Copy XP. BC lets you maintain up to nine internal copies of logical volumes on the disk array.																								
CA	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of logical volumes on a remote disk array.																								
DKC (disk controller unit)	The array cabinet that houses the channel adapters and service processor (SVP).																								
DKU (disk cabinet unit)	The array cabinets that house the physical disks.																								
emulation modes	<p>The logical devices (LDEVs) in each RAID group can have one of the following emulation modes. The emulation mode determines the capacity of the LDEV.</p> <table><tr><td>OPEN-3:</td><td>2.29 GB</td><td></td></tr><tr><td>OPEN-8:</td><td>6.84 GB</td><td></td></tr><tr><td>OPEN-9:</td><td>6.88 GB</td><td></td></tr><tr><td>OPEN-E:</td><td>13.56 GB</td><td></td></tr><tr><td>OPEN-K:</td><td>1.74 GB</td><td>(XP48/XP256/XP512 only)</td></tr><tr><td>OPEN-L:</td><td>33.94 GB</td><td></td></tr><tr><td>OPEN-M:</td><td>43.94 GB</td><td>(XP48/XP256/XP512 only)</td></tr><tr><td>OPEN-V:</td><td>60.0 GB</td><td>(XP128/XP1024 only)</td></tr></table>	OPEN-3:	2.29 GB		OPEN-8:	6.84 GB		OPEN-9:	6.88 GB		OPEN-E:	13.56 GB		OPEN-K:	1.74 GB	(XP48/XP256/XP512 only)	OPEN-L:	33.94 GB		OPEN-M:	43.94 GB	(XP48/XP256/XP512 only)	OPEN-V:	60.0 GB	(XP128/XP1024 only)
OPEN-3:	2.29 GB																								
OPEN-8:	6.84 GB																								
OPEN-9:	6.88 GB																								
OPEN-E:	13.56 GB																								
OPEN-K:	1.74 GB	(XP48/XP256/XP512 only)																							
OPEN-L:	33.94 GB																								
OPEN-M:	43.94 GB	(XP48/XP256/XP512 only)																							
OPEN-V:	60.0 GB	(XP128/XP1024 only)																							
FC	Fibre Channel.																								
FC-AL	Fibre Channel arbitrated loop.																								

FCP	Fibre Channel Protocol.
GB	Gigabytes.
HBA	Host bus adapter.
host mode	Each port can be configured with various host modes. The host mode determines the array's behavior toward a specific host.
HP	Hewlett-Packard Company.
H/W	Hardware.
LDEV	Logical device. An LDEV is created when a RAID group is divided into sections using a host emulation mode (for example, OPEN-9 or OPEN-M). The number of resulting LDEVs depends on the emulation mode. The term LDEV is often used synonymously with the term volume.
LU	Logical unit.
LUN	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV, and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs will have a size of 4,693 MB.
LUSE	Logical Unit Size Expansion, a feature which logically combines LDEVs so they appear as a larger LDEV. This allows a LUN to be associated with 2 to 36 LDEVs. Essentially, LUSE makes it possible for applications to access data requiring a large amount of disk space.
MB	Megabytes.
OFC	Open Fibre Control.
OPEN-x	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-3, OPEN-9, OPEN-L, etc.). Supported emulation modes: OPEN-3/8/9/E/L.

XP48
XP256
XP512

OPEN-K/M are also supported.

XP128
XP1024

OPEN-V is also supported.

OS	Operating system.
PA	Physical address.
path	“Path” and “LUN” are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs.
PC	Personal computer.
port	<p>The number of ports on an XP disk array depends on the number of supported I/O slots and the number of ports available per I/O adapter. The XP family of disk arrays supports Fibre Channel and SCSI ports. <i>I/O support may vary with the selected disk array.</i></p> <p>Ports are named based upon their port group and port letter. Examples of port names include CL1-A through CL1-R and CL2-A through CL2-R (letters I and O are skipped).</p>
P-P	Point-to-point.
RAID	Redundant array of independent disks.
RC	HP StorageWorks Remote Control XP. A software product used for managing XP arrays.
remote console PC	The PC running HP StorageWorks Remote Control XP.
R-SIM	Remote service information message.
SCSI	Small computer system interface.
SIM	Service information message.

SNMP	Simple Network Management Protocol.
SVP	Service processor. A laptop PC built into the disk array. The SVP provides a direct interface into the disk array, and is used by the HP service representative only.
TB	Terabytes.
TID	Target ID.
VSC	Volume Size Configuration.

A

- adding
 - pairs 110
- authorized reseller, HP 10

B

- block size 42

C

- C/T (pairsplit-S async option) 133
- cache
 - inflow control 38
 - size 43
- Cache LUN 44
- calling the Support Center 186
- channel demand 42
- channel extenders, UltraNet 55
- communication time out (RCU status) 178
- componentscomponents 17
- consistency group 20, 33
 - deleting all pairs in group 131
 - options 33

Continuous Access

- components 17
- copy modes 27
- disaster recovery 162
- fibre remote copy connections 57
- pair status 25
- remote copy operations 26
- serial remote copy connections 51
- sharing volumes with ShadowImage 45

Continuous Access Async

- analyzing consistency of S-VOLs 169
- cylinder bitmaps 30
- pairresync options 129
- pairsplit-R options 126
- pairsplit-S options 133
- suspended pairs 31
- troubleshooting 183
- update copy operation 27

Continuous Access error codes 185

- Continuous Access pair
 - creating (paircreate) 110
 - deleting (pairsplit-S) 131
 - resuming (pairresync) 127
 - resyncing 128
 - splitting (pairsplit-R) 123
 - status 25
 - viewing status (pairdisplay) 116
- Continuous Access Sync
 - update copy operation 27
- control units (CUs) 18
- conventions
 - documentation 8
- COPY (pair status) 121
- copy mode 27
- creating pairs 110
- currency of S-VOLs 168

D

- data migration and duplication 135
- data migration using Continuous Access 135
- database recovery 166
- delete pair by force (pairsplit-S option) 133
- delete range (async) (pairsplit-S option) 133
- deleting
 - pairs 131
- deleting (Async pair status) 122
- disaster recovery
 - currency of S-VOLs 168, 169
 - file/DB recovery 166
 - host failover 165
 - preparing for 162
- disk arrays
 - supported 7
- documentation
 - conventions 8
 - related 7

- drain (pairsplit-R option) 126

E

- error codes 185
- error level (async) (pair option) 26, 113
- ESCON cables, directors, repeaters 51

F

- failover, host 165
- fence level (pair option) 26, 113, 163
- fibre remote copy connections 57
- file recovery 166

G

- group
 - pairresync option 129
 - pairsplit-R option 126
 - pairsplit-S option 134
- groups 33

H

- help
 - obtaining 8
- host failover software 165
- HP
 - authorized reseller 10
 - technical support 9
- HP Performance Advisor 48

I

- initial copy
 - operation 27
 - pace (pair option) 26, 113
- initialization failed (RCU status) 178
- installation
 - preinstallation 60
- invalid port (RCU status) 180

L

LU Size Expansion (LUSE) 44

M

MCU

powering off/on 156

migration using Continuous Access 135

N

never (fence level) 164

O

options

pairsplit-R 125

P

PAIR (pair status) 121

Pair List (Pairsplit-S) panel 132

pair status 25

COPY 121

deleting 122

PAIR 121

PDUB 122

PSUE/PSUS 28

PSUS 121

SMPL 121

suspending 122

troubleshooting 181

Paircreate 110

pairsplit-R options 125

path

adequate number of 43

troubleshooting 178

PDUB (Continuous Access LUSE pair status) 122

pending update (async) (pairsplit-R option) 126

pinned track 187

Planned Outage 156

point-in-time copy 137

PSUS (pair status) 121

purge (pairsplit-R option) 126

P-VOL

fence level 26, 113, 163

pinned track 187

R

RCU

powering off/onPlannedOutage 156

RCU port number mismatch (RCU status) 180

recordset operationsRecordsetOps 34

related documentation

list of 7

Remote Console PC 23

remote copy connections 51

remote I/O (RIO) operation 35

resource shortage (MCU/RCU) (RCU status) 179

resyncing pairs 128

S

Secure Manager 44

see consistency group 33

see pair status or path status 25

sequential write operations 42

serial number mismatch (RCU status) 179

serial remote copy connections 51

service information message (SIM) 185

Shadow Image 45

shared HMRCF 45

sidefile threshold 39

SIMs 185

SMPL (pair status) 121

SNMP trap 186

status 25

- Support Center 186
- suspend kind (pairsplit-R option) 126
- suspend range (async) (pairsplit-R option) 126
- suspend type 181
- suspending (Async pair status) 122
- S-VOL
 - analyzing currency of 168
 - pinned track 187
- S-VOL data (fence level) 163
- S-VOL status (fence level) 164
- S-VOL write enable (pairsplit-R option) 125

T

- technical support
 - HP 9
- troubleshooting
 - general 176
 - RCU path status 178
 - suspended pairs 181
 - TCA suspension conditions 183

U

- UltraNet Storage Director 55
- update copy operation 27

V

- Virtual LVI/LUN 44

W

- write-intensive workloads 42